THE

AMERICAN NATURALIST.

Vol. x. — May, 1876. — No. 5.

ANIMAL HUMOR.

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"The heart is hard . . . that is not pleased
With sight of animals enjoying life,
Nor feels their happiness augment his own."

WHAT deep philosophy might be evolved from an honest contemplation of animal sports! Just here a child may turn catechist, to the confusion of the wise man. Whether well or otherwise, Cowper's words have been allowed to push us into the vein. He gave us our first draught of literary humor. It was long ago, but it comes up to-day as a delicious vision. The first poem that made our almost baby cheeks to dimple with ringing laughter was John Gilpin; and when told that its author kept three pet hares, Puss, Tiney, and Bess, in our boyish estimate he became at once a right proper man. And the later judgment confirms the youthful verdict. It has seemed to me that it is with animals much as it is with other folks; the jocose and the pathetic, the gleesome and the sad, are very often from the same stock born. There is a rough-and-tumble mirth, enjoyed alike by dogs and boys, yea, and those semi-barbarous ones denominated "roughs." It is observable of this kind of play, with both the dogs and the urchins, that, however high their glee, a small thing will put out all the fun. A decayed apple rightly thrown is often sufficient for this purpose: the whole effervescence is over, and the fun is flat as stagnant water.

In the departed days when one chair in college took several "ologies," our good old "Prof." was a very funny man. He was intensely practical. His jokes, even, were kept in stock and calendared; each had its own time and purpose. There was his "star joke," always pronounced "huge and capital." This bit of wit, with stately introduction, was regularly aired in sophomore year. A wicked junior informed us just when to expect it. Being now no longer fresh and green, it was resolved in class

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caucus that we would conduct ourselves as behooved philosophers, when this laughter-provoker should make its annual round. At the expected time it came, and was really excellent. The professor let it off in good style; then he laughed heartily at his own wit. And why not? He had done so annually for a generation of years. But, alack! nobody joined in the chorus! Such a refrain! It was unanimous. The class were as demure as a pack of wearied mules. Every face was stolidly, starkly blank. As a humorist, that rotten apple had "put a head" on that learned man. Whether this cruel shock had caused the lesion of some nervous centre was not known, but we never heard the professor joke or laugh in class again. Ever after, the humanities were dispensed very dry, and ethics, his forte, were especially served up quite plain. Sorry for our naughtiness, we came to regard our action as a second-class joke.

Within hailing distance of our former home at Keyport was the shop of a basket-maker. A pet monkey was the occasion of many an uproarious scene in the shop. In fact, all hands sometimes played monkey, the quadrumanal leading off, hunted by the bimanal ones, over and through the sinuosities of great heaps of oyster baskets. Unaware of our seeming pedantry, we ventured to say that the specimen belonged to the family *Cebidæ;* this was promptly corrected by an apprentice, who told us that it belonged to the "boss's family." Happily, we were both right. It was one of the spider monkeys, and known as *Ateles Belzebuth.* "The devil it is," said the apprentice. "You bet, there 's deviltry enough in that monkey." To this we condescended no reply, regarding it as a little profane, and a good deal libelous. We continued by saying that the monkey came from South America, where they called it the "marimonda." Again came an interruption from the facetious apprentice, who said, "There *is* a heap of mountebank in the little cuss." The wee thing was a slim-bodied, long-limbed, and grotesque-looking creature, and withal gentle, and confiding, and brimming over with fun. It was quite fond of a good-natured romp with the men and boys, when it would jump from one to the other, and cast around their necks that marvelous fifth hand, its prehensile tail. In tit-for-tat, tag-and-run, its agility and tactics were splendid. All this was very fine for a few days. But this good-natured romping soon became ill-tempered and vicious on the part of the shop hands. In truth, erelong that sense of feeling tired set in which so soon comes upon many an owner of

pets. Then came heartless practical jokes, harsh treatment, and general neglect. The poor creature had now evidently lost all heart. Something worse than the throwing of the rotten apple had happened. Marimonda was clever at catching sticks. A hot poker was thrown to it, — the burning shame! Poor thing! It now broke down completely, and made up its mind to drop all fun forever. Not at all vicious, still gentle, but joyless, it became chronically sad. Prematurely grave, for it was very young, the merry Marimonda was mirthful no more. I told its tormentors that the little fellow's days were numbered; in fact, that they were killing it. Already it had lost confidence in every one of them; but the first time that Ateles heard my voice, it approached me with a trustingness which was quite affecting. It attracted the attention of the workmen, one of whom said, "Just look at that! The beast won't come nigh any of us, and always fears a stranger; but see how it takes to the minister from the first time that it puts eyes on him. It fairly whimpers when it hears him coming." All this was true. And for that whimper — it was a plaintive coo, soft and flute-like. True it was, whenever I called at the basket-maker's shop I was sure to be met with the love-greeting of little Ateles, a soft, cooing utterance of trustful joy. But there was much plaintful, tender melancholy in it, for the wonted merry mood of Marimonda was forever gone. That there was real affection in that little heart, I entertain no doubt. Its gentle eyes told all this plainly whenever they saw me coming. Such manifestations could not be other than touching, they spoke so unmistakably of an implicit faith in me; and it is evident that it yielded the fruits of peace to the trusting one. I think with animals, as with men, humor and gentleness go together; and if either survive the other, it is this goodness that gleams when the other light is put out.

I would not have it implied that this glinting towards, or even assimilating, the higher attributes of man makes our monkey less simian, but I would insist that such qualities should not be reckoned brutish. It is these touches of nature that make the whole world kin. I never dared interpret the words of that apostolic man, words so weighty with significance, whatever that may be, to every thoughtful mind: "For we know that the whole creation groaneth, waiting for the adoption." Yes, trust is needed at the dark end of the journey. I have had a mouse creep into my hand to be covered, and to die.

Poor Marimonda soon came to grief. A pot of green paint

unintentionally set in the way proved too much for simian curiosity. She ate of the pigment, and in pitiful agony perished. This was dolorous tidings to us, and our temper rose to a spurt of indignation. Ah well, our soul contains no green-room secrets, so it may as well be confessed: it did make our placid spirits rily to see our pet comique go off like a contemptible Doryphora, dosed with Paris green.

Shall not proper names be respected? And were not James and John apostles? How then could our learned friend ever again speak in meeting after that irreverent pun of calling his two monkeys, Jack and Jim, "the sons of Cebidæ"? But there are some things that common folks cannot cope with. Once happening in upon our savant friend, we made the acquaintance of Jack, who now was alone. As his master said, Jack was a *Cebus*, and his proper name was *Cebus capucinus;* hence he was a cousin, so to speak, of our Ateles, as they both belonged to the same family, *Cebidæ*. I suppose that *capucinus* would indicate that this *Cebus* had a monkish head on his shoulders. Though very much more demonstrative, Jack had not the winning ways of Marimonda. His accomplishments were in another line. While the voice of Ateles was soft and musical, and in general her actions were gentle, Jack abounded in guttural gibberings and genuine monkey grimace. I had never before seen Jack, nor indeed, except the one fact of his remarkable sonship, had I even heard of him. When I entered the house he was chattering in his cage. I approached and said, "Poor Jack!" at the same time extending to him both my hands. He took a finger of each hand of mine into each of his tiny hands, and as he held me thus, he gazed into my eyes as a discerner of spirits might who is divining from the tone of voice and the light of the soul-windows. The query in Jack's mind was, "What sort of stuff is this new fellow made of?" Mental movements are sometimes miraculously quick, and that monkey's mind was made up like a flash. The savant looked on in surprise. "You are the only one," said he, "that Jack has taken a liking to at the first glance." Of a sudden my host set up a terrible to-do, as if he would have me torn to pieces, crying, "Go for him, Jack! Go for him!" But Jack looked perplexed, as he evidently liked me. He still held me by a finger of each hand; and it was plain that he would rather go *for* me, than *go* for me. Again, however, the master shouted excitedly, "*Go* for him, Jack! *go* for him!" And Jack, in obedience to command, *went* for me, shaking my

hands by the one finger of each as if he would impress me with the fearfulness of simian anger. And how wide open he kept his mouth, and how the white teeth shone, as from between rushed a torrent of gibbering rage! Now this perfunctory tempest was exceedingly well gotten up, considering the shortness of the notice. The part was well acted; the best make-believe anger I ever beheld. Of course it was the sheerest sham. The creature would not hurt a hair of my head. His owner's commands obeyed, he turned his attention to me from a friendly point of view, and began making a minute inspection of my hands, especially the lines in the palms, as if he might be practicing palmistry, he looked so grotesquely grave.

Jack could catch, with either hand, a nut when thrown to him, and crack it with a stone as deftly as any one. He had his patience once sorely tried with an obdurate black walnut. His mistress put a large stone in his reach. It was so heavy that Jack had to walk nearly upright in order to keep his balance when he sought to carry it; but he succeeded, and down, with the nicest aim, came the stone upon the nut, which was fairly smashed. But if you would evoke the animal's genius, it was only necessary to tantalize him a little by putting nuts on the floor at an inconvenient distance from his cage. With a doubled string he would throw the loop, and lasso in the prize. We have seen him attain his object by the most persistent and ingenious movements of an awkward angular bit of pine wood.

On one occasion a gentleman called who was bald. Our Cebus regarded the visitor with unfriendly wonder. Why should he be less like him than other folks were? Had not other men, like monkeys, hair upon their heads? Was not this making an invidious distinction, perhaps to the disadvantage of capucinus? Of course, no son of Cebidæ could say, "Go up, thou bald head!" Still Cebus was in no reverent mood, albeit he did show off his accomplishments in the line of getting the nuts off the floor. He was next ordered to *go* for the gentleman, which order he executed with alacrity and spirit. As Cebus was securely confined, this paroxysm of obedience hurt no one. "But," said the gentleman, as he turned his back upon the cage to address his host, "I think his dexterity with that stick is wonderful, and shows him capable of even stranger developments." The gentleman was correct; and whether the droll beast was affected by the compliment or not, we cannot say. It was an inexplicable incident, however, that at that especial moment the angular wand was

brought down with intense simian anger upon that glistening pate. It did look as if Cebus thought, "Let me 'put a head on' that flattery!" The gentleman's feelings may be judged from his actions. Up rose a livid spot, on which, like a soothing poultice, one hand was tenderly placed, as old Uncle Ned would say, —

"In de place whar de wool ought to grow."

Now in all this we find incongruousness and surprise, and, to the spectator, sparkling, rollicking fun. In words, it would have the startle and unexpectedness of wit; in pantomime, that scene would bring down the house like a hurricane. Is it supposable that Jack was unconscious of the fun? I do not think that he was altogether funnier than he knew.

Is it not noteworthy that the fun of animals is chiefly got at in sham battles, amid the roar of mock anger? Boys too often love to tease and worry animals, and not less one another. It is with the same impulse one ties a tin utensil to a cur's tail, or pins some annoyance on a playmate's back; and from the same source come tripping, and sparring, and knocking the hat down over its owner's eyes. If motive be the gauge, how fine the line between much of boyish roguery and monkey mischief generally. Ateles played tag, and Cebus attacked our humble self in fun and the bald man in earnest. On the doctrine of identity, our illiterate neighbor spoke more astutely than he supposed when he bade a teasing wag not to cut up any more monkey-didos with him.

Have we not seen in some men a humor of an inhuman sort, the delight in torment and destruction? Some one has called it "pure cussedness." Mixed with better traits, Cebus had this malady in streaks. He got loose once, and found his way to the closet of confections. A few minutes sufficed him to eat to satiety; then the "pure cussedness" began to play. He took the precious sweets from the jars and threw them on the papered walls of the drawing-room. Oh, was not this the very delectation of fun? "A melancholy scene," did you say? It was Miltonian: "Delectable both to behold and taste." Then came the smashing of glass and china, a most exciting perfomance. The scene of operations was now changed to the museum and study of the naturalist. Here he discovered a rich and novel field for the exercise of his peculiar talents. An aquarium contained a number of living salamanders. Cebus began an investigation. He is quite curious about live things. If in the present instance vivisection was intended, it was very bunglingly done. Each one was taken out of the water, separately examined, its head

taken off, and head and body laid on the floor. Jack had now had a tearing time. The mischief done seemed to be to his heart's content, so he slunk back to the shelf in his cage, on which he sat, and looked the very image of demure and passive harmlessness. We find here a humor of a grim and brutal sort, senseless and wanton, — as when the vicious boy who had badly burned a cat was asked his reason, and said, "Oh, I don't know. Only just for fun. I did n't mean anything." Human conduct abounds in this meaningless deviltry. Maybe this ogreish humor is a phase of that total depravity belonging alike to beasts and men.

But for striking contrasts of fun and gravity, commend us to our young dog, Dick. On his mother's side he came from a high-bred stirps; of his father we know nothing. When Dick set about a frolic, all his powers were enlisted for the occasion. In the truest sense he gave his whole mind to it. At make-believe anger no canine actor could excel, and I have not witnessed his equal. I have seen him fly at his mistress, whom he loved with all the ardor of a devotee, as if the very furies impelled him. He would take her bare arm into his mouth and growl with the seeming ferocity of a Cerberus. Indeed, the savagery of that growl was one of the high colors in the picture. Had Dick been homo instead of canis, his histrionic rôle would surely have been a buccaneer, bandit, or some such marauding man of blood. No stage-strutting hero could roll his gutturals more fearfully. A stranger entering during one of Dick's tragedy fits would have thought his mistress a doomed woman. Make believe mad? Why, Dick would simulate "the very torrent, tempest, and whirlwind of passion," and all in the merest fun, simply a doggish joke, for when the splurge was over, not the least mark would there be on my lady's imperiled limb. I have more than once seen this animal in real rage, but it was mild compared to the apparent anger of these sham outbursts. And Dick would let off some merry jets of doggish humor. When encouraged to do so, he would laugh, and so droll were these canine cachinnations, that they would set the household in a roar. He would also stand up at the table, and, when told, would make a feint at a baby cry for a morsel of meat, which was very ludicrous. And, what was very strange, he could offset the wildest frolic with the staidest sedateness of conduct. He could turn on the instant from the comical to the grave. As we sometimes found, this very gravity was to us decidedly annoy-

ing and inconvenient. If permitted to accompany me on a village stroll, he would walk behind with the deportment of a footman of the olden time; but let a dog come along and look askance at his master, especially let his tail come in contact with him, however accidental it might be; it made no matter about the size of the offender; if Dick was small he was spry and wiry, and generally the chastisement he administered was short, sharp, and decisive. If it were a large dog, Dick would attack him scientifically. He was agile as a deer. If the subject for correction was one of the heavy weights, Dick would spring into the air, and, descending upon him, inflict a bite in some unexpected place, his complicated tactics and rapid evolutions begetting in the mind of the burlier beast a perplexity like that of the Iron Duke when he beheld the strategy of the little Corsican: "Hang the fellow! he fights contrary to rule!" Dick's solicitous attention to his master's personal welfare, though in spirit admirable, through his way of doing it had become to a degree oppressive, as the minister's good name was now associated with some notable canine contests. What would you think of the town *Chronicle's* going out of its way to wind up a dissertation on Village Dog-Fights thus: "As regards this well-fought contest between the expressman's big dog, Whitey, and the little Dominie in black, all must admire the dogged valor which gave victory to the latter, and sent the former from the field with a sad curtailment of his high prestige; and we cannot but compliment the professional gentleman on his being possessed of so large an amount of fighting capital, as the outcome of so small an investment in dog-flesh. The next time the little Dominie in black goes in, in the language of Lord Macaulay's old Roman, 'may we be there to see.'" Of course such ethical whisperings from so immaculate a source as the public press must be heeded. Having occasion to go to the railroad depot, we took the precaution to shut Dick up. But love laughs at locksmiths. Dick was at the depot as soon as his master, and occupying his usual place behind him. On came the train. A village mongrel, notorious for its habit of following horses and barking at them, came yelping defiantly at the iron horse. We stood waiting for the train to stop; this done, the bully dog retraced his steps to the platform, his tail wagging, expressive of approbation of his treatment of the great fire-fiend. It was evident that Dick, who had kept close to my side, viewed the whole performance with honest but intense disgust. Generally, dogs take to us instinctively;

they seem to know that we like them; I have almost wondered if the genius of their race has not heard us quoting, "I am the friend of dogs, for they are honest creatures." However that may be, the bully dog approached us and looked as if claiming our approval of his conduct. To Dick this seemed sheer impudence, and an imposition on his master's good nature which on his part should not be allowed to go unpunished. The bully dog was the larger, and stood his ground well for a few moments, but the punishment Dick administered was very severe, and Sir Lofty withdrew in a very humble mood. Our efforts to take Dick off were of no avail. He would never leave a job unfinished. To our astonishment and disgust we heard the compliment from the crowd, "Good for the little Dominie in black!" Now, as the words dominie and clergyman are in these parts convertible terms, the minister naturally felt this to be a slur of an unpleasant personal character.

With all his accomplishments, Dick is quite a young dog, but at an early age he gave us a manifestation of a very touching nature; if it had been in a child it would have been called filial; such as know the least about it will, as is the wont, probably call it instinct. The dog had been engaged in a very hearty, rough-and-tumble game with our youngest boy, on the kitchen floor; this gave Dick a decided advantage, and he made the best of it. At this juncture, old Maje, blind and decrepit with age, began whining at the door to go out for his daily airing. The day was very cold, and the ground white with the first decisive snow of winter. All this Dick knew, as he had been out that day, but old Maje, who was stone-blind and nearly deaf, was ignorant of the situation. Dick at once stopped his fun and went out with the old dog. The poor old beast was on a call of nature; Dick understood it all, and by certain pushes and other little canny devices got the old fellow to a proper place. Returning, he continued the same kind offices, taking care to get so beside the blind dog as to prevent his passing the door. Now just think of all this. The new snow had put the blind dog at a disadvantage by rendering the faculty of scent of small avail. All this the young dog comprehended; and then he did not wait for the old dog to make known his wants by a cry or otherwise, but actually and promptly anticipated them. Allowing the dog-mind to have worked as would the man-mind, — and what other way in this case is supposable? — then are there not some fine points in this benevolence of the young dog? We may men-

tion, too, that this self-imposed charity of the young dog was regularly repeated under similar conditions. An instance may be stated, as it excited in us who watched from the window both amusement and admiration. Though there was no snow, the day was extremely cold. The old dog wanted to go out, and Dick, of his own accord, took charge of him. I verily believe that the conception of the young dog was that the old dog stood in danger of getting frozen from inability to find his way back to the house. But the old fellow, who does nothing but eat and sleep, is as fat as a bear about hibernation time. He fairly waddles with his environment of adipose tissue. Not so his youthful guide, who is wiry and lean from incessant activity. Now old Maje, feeling no discomfort, was in no haste to return; but poor Dick stood shivering with the severity of the weather, and actually whined in his impatience to get the old dog home again. Still, notwithstanding the provoking insensibility of the old dog, his young benefactor did not leave him a moment until he had him safely housed once more.

On this twenty-ninth day of February I went to see a seal on exhibition in New Brunswick, New Jersey. It had just been captured in the Raritan River, but a little below the city. The animal had fallen victim to a habit well understood by fishermen in other parts of the world, that of visiting a seine for the purpose of stealing fish. The difference was that this was a young seal, — it weighed but one hundred pounds, — and was not up to the tricks of the old ones, who knew the ins and the outs, and could elude the fishermen. This baby seal was rather pretty. Its sides were mottled with *quasi*-leopard spots on a brown ground. The species was *Phoca vitulina*, the calf-seal, so called because of a calf-like cry which the species can make. There was nothing calvish in the conduct of the captive, however. Its captors were attentive to its wants, and really very kind to it. One of them undertook to pat it on the head, and got an ugly bite for his goodness. And what a head, so like that of a highly intelligent dog; well might Cuvier call the group *Callocephalus*, the beautiful-headed beasts, so pretty are they, and so knowing, with their large, black, lustrous eyes. Now, among the quadrupedal mammals, the seals almost seem to lead off the *Educabilia*, or intelligent animals, in cranial excellence, owing to their high, thin-boned skulls and their large and finely convoluted brains.

It must then be that the seal is not without a faculty for fun. How great its capacity for instruction is, we know. I was greatly

interested in observing its skill in disposing of an unsizable fish. Unfortunately, the seal to thrive in confinement must be well fed; hence in its best condition it becomes lethargic, and there is too great a discount on its natural playfulness. They romp and tumble with one another, and have sham contests. But I once saw a seal that had dined to its satisfaction, and had one fish to spare, which was a menhaden. Feeling well after a good meal, it was in excellent disposition. It actually began to play with that remaining fish. It would seize the fish in its mouth, and, by means of that singularly springy neck, would with a jerk send it six or seven feet high in the air, and would utter a bark of delight, not unlike a pup, when the prey would fall splashing into the water. Then in bubbling glee our sea-dog would toss it into the air again. Then there were certain divings, and splashings, and bodily contortions, and shakings of the insensate fish as if it were alive, — actions all indicative of high animal enjoyment. I should think that this sport continued not less than ten minutes, when the animal probably was somewhat tired.

The question arises as to the kind of fun, that is, its mental character. Was it like that of a boy tossing and catching his ball, a simple exercise of skill? Or was it like the gambol of a lamb or a kid, mere animal gush? I think it was like neither. It had in it a tinge of malicious exultation, the strong making game of the weak. How a cat will purr while it tosses the poor mouse, still alive, and perhaps even unhurt. There is in this a grim complacency, what seems to me a sort of vicious enjoyment, if not of devilish delight. The boys had their fun, though it was death to the frogs. I think, too, that all this is germane to the experience of certain natures sodden with chronic irony. There can be no doubt that carnivorous animals enjoy the excitement of pursuit, and preëminently the success of capture. As a rule, too, it is probably true that while hunger is unallayed no time is lost in sporting with the captive prey; also generally no captures are attempted except when necessity prompts. But some animals will capture and destroy sometimes for no other reason than that there is opportunity to do it, and they find fun in so doing. Alas, that, in this regard, in most unmanly preëminence stands man himself!

There is an animal also of thin skull and large brain capacity, noted for its puffing and blowing as it gambols in the sea. This is the porpoise, *Phocæna communis*. Twenty years ago it was often seen in Raritan Bay. To us the sight was full of interest.

With what a rhythmical movement these monsters would gambol along in line, one huge fellow taking the lead, and every one behind duplicating his movements, pretty much like the play of boys, "follow your leader." These porcine mammals of the sea follow the migrations of the *Clupidæ*, the family of fishes in which the shad, menhaden or moss-bunker, herring, and others are found. Thus we see it especially in the spring and fall. As food is his object, the porpoise keeps in their wake, and that of the fierce and active blue-fish, *Temnodon saltator*. Not more terrified would a herd of gazelles be before a band of tigers, than is the moss-bunker, *Alosa menhaden*, when pursued by the blue-fish. The poor things crowd like a moving bank, compacted by the devouring pursuer, and the pursuer, so intent upon his victims, is in turn pursued; for the porpoise is pressing behind.

Though I implicitly believe it myself, yet I did not see what I am about to relate. I have heard it more than once from the eye-witness, an intelligent and much-respected man. He had been commander of a coasting vessel. Said he, "It was early fall, and I was running with garden stuff from Keyport to New York. I saw several porpoises. They were going in a line, much as you always see them, but the two head ones had each a blue-fish, with which it played as a cat does with a mouse. They were some distance off, and I might be mistaken about the height; but each porpoise would throw up its fish high into the air, maybe ten or twelve feet, as nigh as I could judge. Just after each toss-up of the blue-fish, each porpoise would duck its nose, by a forward pitch of its body."

"That was indeed surprising. Let me ask, Did each porpoise catch the fish when it fell?"

"That I could n't say, but should think most like not. I think it picked the fish up each time. One of them I know tossed its fish up at least seven times in close succession, before it stopped. I am satisfied, too, that it was one and the same blue-fish all the time."

"Well, well," we thought. "Then this queer, ogreish fun is found among porpoises, seals, and cats! And is not this, the grimmest, whether among animals or men, also the lowest humor?"

In regard to Jack's lassoing the chestnuts on the floor, I do not see, with an able thinker, the necessity of his inheriting the trick, as an achievement by some arboreal ancestor who used a vine or pliant twig to loop in some coveted fruit on the tree.

That Jack might have had a grandfather smart enough for that, one may not dispute; but that he ever had an ancestor similarly held in limbo, and tried as he had been, is far from probable. Necessity is the mother of invention; and to me it seems that Jack, with no thanks to any ancestor, had to exercise his own wits in an original way. We had a coati-mundi, *Nasua fusca*, which we often tantalized with an egg, a dainty that it loved too well. Having tied the animal by the neck to the table leg, the egg was put at an unreasonable distance on the floor. The animal would tug at the string, and make most earnest efforts to obtain the prize, first by the use of the forefeet, and then, failing, by the use of the hinder. This being also of no avail, it would change its tactics completely, pulling by its neck at the string, so as to extend its body hindward as much as possible, then stretching its tail towards the egg, at the same time bending it to a little curve at the end; then steadying and stiffening the tail by the use of one hand, with which hand a gentle pushing movement was secured, and the egg was rolled in a curve, which was shortened by the shortening or increased bending of the tail, and so the prize was brought within reach. To my mind there seems to have been but one view of the case possible to both animals. When the exigency first arose, it was to each one a new problem, and had to receive from each an original solution. The monkey got at it by looping a string, and Nasua by curving the caudal extremity; and, let it be noticed, each one used the improvised implement, so to speak, in his hand. In this way the one got the chestnuts, and the other got the egg. The point is that, whatever of intellectual force each might have inherited, each had to meet the exigency for himself, and in his own way. Coati and Cebus had each to rebus the riddle for himself. However easy it might be afterwards to each, it was at first an invention.

And now, what of it all? It was not designed to inflict upon our friends a weary homily. We felt like stealing, as through a chink, a glance at the knowingness of the lower animal life. Surely there is among them, as related to a psychology of their own, a true humor, if one could but get at it; and is it not worth the delving? This unfeeling humor of the cats and porpoises and seals; that dogged gravity, rollicking mirth, and filial bearing of the canine Dick; the chattering sport, the grotesque fun, the utilitarian genius, and the discerning spirit of that "son of Cebidæ;" the flute-like cooing, harmless play, social disposition, and pa-

thetic trustfulness of the poor monkey, Marimonda, — what of it all? "Ah!" said our friend with the orthopterous "doxy," but who is afraid of crickets, and despises bugs generally, "Don't you mind; is it not all simply instinct?" "No," we answer, "but a part of a grand something, more complex and less blind; a fabric which God has been building since before the world." Our friend, who looked astonished, was one who always made full tithes of the anise and the cummin, even if he did overlook the weightier matters of the law. Hence he was so particular about his vowels, too. "Fay-brick, fay-brick," he reiterated; "what do you mean?" "Ay, bricks; ay, bricks, indeed," we said, simulating the sound, "bits of the divine temple, you know. That is all."

OUR WILD GOOSEBERRIES.

BY PROFESSOR ASA GRAY.

THE AMERICAN NATURALIST may be of much use as a medium of communication with every part of the country, and our scattered botanists may turn it to greater account than they have yet done. There are many queries to ask, and bits of information wanted, which the local botanist or zoölogist may answer or supply with little trouble and essential advantage to the science. The only difficulty is to bring the demand into connection with the source of supply. For that I know no better way, in the present instance, than to use the columns of this widely circulated journal, if I may be permitted to do so. Let me say, then, to the botanists, that the wild gooseberries of the United States are not in a satisfactory condition as they stand in the books, and that information and specimens are needed from very various parts of the country. A response to this appeal made by a few persons happily situated, in this and that part of the country, may perhaps clear up the principal difficulties in the course of the current season.

A cursory sketch of our species as I now understand them may show what is most wanting to a better understanding of them.

I. Let us begin with the species which a gardener might say was a cross between a gooseberry and a currant, namely, —

Ribes lacustre Poir., well marked by having racemes of numerous small flowers, in the manner of a common currant, the blossom as small and as open, and the very small reddish berries

beset with some scattered bristles. This abounds through the north, in cold wet woods from Newfoundland to the Pacific. There is a dwarf variety of this in the higher Rocky Mountains and northwestward, smaller in all its parts, and with fewer-flowered racemes. In some publications I have called it *R. setosum*, a species said to have been raised by the Loddiges from seed sent by Douglas. This very one was received from the Messrs. Loddiges under that name thirty years ago, and cultivated in the Cambridge Botanic Garden. Yet it is not the plant published and figured by Lindley, as will be presently seen. I pass to

II. The true gooseberries, with peduncles bearing only one or two or at most four flowers, and calyx-cup bell-shaped or tubular. These may be roughly arranged in three sets by the color of the flower.

(1.) Yellow-flowered. The only one of this subdivision is the *R. leptanthum* Gray. It belongs to the Rocky Mountains of Colorado and New Mexico, and to the drier parts of the Sierra Nevada. It was first collected by Dr. Edwin James in Long's expedition, but was named and described long afterwards, from Fendler's New Mexican collection. It is an insignificant, small-leaved, and slender-flowered species. The dried flowers do not seem to have been really yellow, but they are said to be so by the collectors in the Sierra Nevada, where, however, the flower is generally shorter, broader, and more downy. We would ask those who have met or may meet with it in the Rocky Mountain region if the flowers are really yellow or yellowish there.

(2.) White or greenish flowered, sometimes with a dull purplish tinge. To this division belong all our edible gooseberries, and here lie the main difficulties in the way of distinguishing the species.

Two of these may be known from the rest by having the lobes of the calyx decidedly shorter than the tube, and their berries are apt to be prickly. They are

R. setosum Lindl., a white-flowered species with a narrow cylindrical calyx-tube. It takes its name from the slender scattered prickles on the branches; but these are sometimes wanting, this being an inconstant character in all the species. The young berries are either perfectly smooth and naked, or beset with a few bristly prickles. This is the *R. oxyacanthoides* of Hooker's Flora, but certainly not of Linnæus. It belongs to the Saskatchawan region, extending into Montana and Wyoming. No. 107 of

Dr. Parry's Wyoming collection is a small-leaved form of it, which was mistaken for *R. leptanthum;* but the flower is perfectly smooth, evidently white, and the style deeply cleft and hairy towards the base. I suspect that this species inhabits the northwestern shore of Lake Superior. Botanists visiting that district should look for a species with pure white flowers, a half-inch or less in length, with cylindrical tube, and stamens decidedly shorter than the lobes.

R. cynosbati L. This dogberry, as the name denotes, is well marked by the usually strong prickles on the fruit, weak prickles on the stems (the thorns sometimes wanting altogether, but occasionally well developed), slender peduncles, and especially by the broadly bell-shaped tube of the greenish flower. It is common from Lower Canada to Illinois, and in the Alleghanies to Virginia. It is found occasionally with the berries as well as the stems wholly unarmed.

In the rest of this section the calyx-lobes are decidedly longer than the short, bell-shaped tube; and the berries are smooth and naked, purple, sweet and pleasant-tasted.

R. gracile Michx. is the most distinct of them. It is well named on account of the slender peduncles, long and narrow calyx-lobes, and almost capillary filaments. The latter are half an inch long, generally connivent or closely parallel, and soon conspicuously longer than the oblong-linear calyx-lobes, which, being reflexed in anthesis, as in all these species, then expose the whole length of the stamens to view. The flower is whiter than in the rest of these species, having barely a slight tinge of green. The berry is pretty large, and is prized in cultivation, under the name of Missouri gooseberry. It is the *R. Missouriense* of Nuttall in Torrey and Gray's Flora. It is also, as the figure shows, the *R. niveum* of Lindley in the Botanical Register; and from the character, it is probably the *R. triflorum* of Hooker's Flora. It ranges from Tennessee and Illinois to the northern borders of Texas, and northwestward into the Rocky Mountains. In Michaux's Flora the habitat is the mountains of Tennessee; but I suppose it will not be found in the Alleghanies. A note with the specimens in his herbarium at the Jardin des Plantes records that they were collected "in itinere Nashville."

R. rotundifolium Michx. is a species of the Alleghany Mountains, ranging northward and eastward into New York and the western borders of Massachusetts. Professor Dewey long ago collected it near Williamstown, and Professor Tuckerman's Am-

herst catalogue gives West River Mountain, on the authority of Hitchcock. I wish to obtain flowering specimens of it from all parts of its range; for the limits between it and the following are obscure. Its range is more southern and comparatively restricted; the flower is narrower, and the stamens longer, becoming a quarter of an inch in length and nearly double that of the calyx-lobes; the peduncles also are longer; but this character does not hold out well. Although it belongs to a district most of all familiar to botanists, I have seen few flowering specimens. The New York catalogue in the *Bulletin* of the Torrey Club cites "Fort Lee, W. H. L., and foot of 60th Street, North River, LeRoy." A specimen of the latter is preserved in the Torrey herbarium, and is the European gooseberry. *R. triflorum* Willd is, I think, rightly referred to *R. rotundifolium*, an earlier name.

R. oxyacanthoides L. We must bring this name into use in place of *R. hirtellum* Michx. (which is generally inappropriate), for no reasonable doubt remains that it is the Hudson's Bay gooseberry, figured by Dillenius, upon which Linnæus founded the species. It is the common smooth-fruited gooseberry of New England and the whole region northward, and it extends westward to and beyond the Rocky Mountains, and even into the Sierra Nevada of California. It has shorter peduncles than the preceding, but this distinction is by no means absolute; the flower is broader, and the stamens merely equal or only slightly exceed the calyx-lobes. It is the *R. saxosum* of Hooker, whose *R. oxyacanthoides* is *R. setosum*, while that of Michaux is *R. lacustre*.

R. divaricatum Douglas. This takes the place of all the preceding on the Pacific side, and ranges from the lower part of California (in a downy form, *R. villosum* of Nuttall) to British Columbia, meeting *R. oxyacanthoides* in the interior. There is a form (var. *irriguum*, the *R. irriguum* of Douglas), of which we know too little, which comes near to *R. rotundifolium*. The species is pretty well marked by its slender peduncle and pedicels, mostly 3–4-flowered, oblong and livid-purple calyx-lobes, and short and broad tube; the stamens about a quarter of an inch long, and thrice the length of the broadly wedge-shaped and nearly white petals. The flower, ovary included, is from a third to half an inch long. The berries are said to be excellent.

(3.) Red-flowered species. These all belong to the Pacific side of the continent, are large-flowered, and their berries are unfit to eat.

R. Lobbii Gray. I am under the necessity of giving a name to this little known but apparently very distinct species. It is figured by Hooker in the *Botanical Magazine*, tab. 4931, as *R. subvestitum* Hook. and Arn., from a Californian plant sent by the late Mr. Lobb (whether seeds or young plants is not mentioned, probably seeds) to his employers, Messrs. Veitch and Son. But the only specimens I have seen are one, exactly agreeing with the plate, from Kew, ticketed "Vancouver's Island, Wood," and another, from the Willamette, in the same region, collected by Mr. Howell. It should be particularly looked for in California, north of San Francisco Bay, and along the coast to British Columbia. Perhaps the Californian habitat is an error. The species may be distinguished by its dark, purplish-red calyx of half an inch in length, not counting the ovary, nearly white petals half the length of the stamens, very glandular but unarmed ovary, and especially by the short, oval, and very blunt anthers, which are dotted with a few warty glands on the back. These short and blunt anthers are shared with all the preceding species, but not with the following.

R. Menziesii Pursh, well marked by its sagittate anthers, with a mucronate tip. The flowers are as large as in the preceding, or considerably larger, but variable in this respect, and of a similar purplish-red color; and the berry is large and prickly, usually densely, sometimes sparsely so; the prickles sometimes strong and spiny, sometimes shorter, bristle-like, and when young gland-tipped. It extends from the southern part of Oregon through the whole length of California, and varies exceedingly. *R. subvestitum* Hook. and Arn., as to all the specimens of Douglas, on which it was founded, is a form of the species not far removed from the typical. *R. Californicum* and *R. occidentale* Hook. and Arn. seem different enough in the original and in many other specimens, being very small-leaved and mainly glabrous. I had formerly (in the fourth volume of the Pacific Railroad Explorations) united these two with *R. subvestitum*. I am now of opinion that all are forms of *R. Menziesii*. They are, however, commended to the notice of native Californian botanists.

R. speciosum Pursh. The scarlet-flowered gooseberry of California is so distinct that a separate section has been provided for it. Besides the bright color and ample size of the flowers, its calyx-lobes do not turn back, and are often only four; the stamens protrude for an inch or more, and the rather dry berry is few-

seeded. Its synonymous names are characteristic: *R. stamineum* Smith, for the remarkably long stamens; *R. fuchsioides* Berlandier, for the resemblance to a fuchsia-blossom. In England, where it is hardy, it is prized in cultivation for its brilliant red flowers garnished by the shining and almost evergreen leaves. Trained to the wall of a house, it may be carried to the height of fifteen or twenty feet.

A synoptical view of the species will be convenient: —

Flowers several in a raceme, small and flattish, greenish.....R. LACUSTRE.
Flowers 1 to 4 on the peduncle (calyx-tube at least as high as broad):
Yellow or yellowish, tubular.....R. LEPTANTHUM.
White, tubular, with short lobes.....R. SETOSUM.
Greenish, with lobes shorter than the bell-shaped tube.....R. CYNOSBATI.
White or whitish, narrow, with lobes longer than the tube and shorter than the half-inch stamens.....R. GRACILE.
Greenish or dull purplish lobes; longer than the tube:
Nearly equaling the stamens.....R. OXYACANTHOIDES.
At length shorter than the stamens:
Calyx-tube and lobes rather narrow.....R ROTUNDIFOLIUM.
Calyx-tube and petals broad.....R. DIVARICATUM.
Purplish-red, larger; Pacific species:
Anthers oval, pointless.....R. LOBBII.
Anthers sagittate, mucronate.....R. MENZIESII.
Scarlet-red, very long-stamened, Californian.....R. SPECIOSUM.

MULTIPLICATION BY FISSION IN STENTOR MÜLLERI

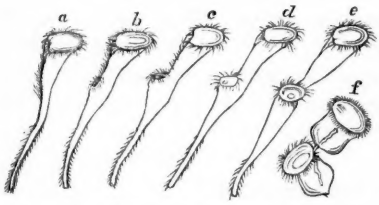
BY HON. J. D. COX.

I HAD the good fortune, one evening lately, to observe the whole process of the division of a large *Stentor Müller* into two complete individuals, by fission. The circumstances were favorable for pretty carefully noting the phenomena exhibited as the change went on, and there were some of them which I have not seen narrated, and which have a direct bearing upon the question of the organization of this group of infusoria.

The water was from the Maumee River at Toledo, Ohio, on Lake Erie, and contained a good variety of infusoria and of rotifers, which had propagated quite rapidly in the glass jar, among some aquatic plants carelessly thrown into it. The specimen of Stentor under consideration attracted my attention by its size, as it was about four hundredths (.04) of an inch in length, the stalk being stretched till it appeared about one half longer than the proportions shown in the engraving of *Stentor Müller* in the Micrographic Dictionary.

Whilst examining other forms in the compressor, I returned to this from time to time to enjoy its beauties, and soon noticed

that the ciliary motion was extending from the disk, at the point of depression in its horseshoe shape, down along the body about one quarter of its whole length, and this gradually became more marked until the Stentor presented the appearance shown in outline in Figure 16 *a*. The portion of the body immediately under the disk swelled slightly, and the general form somewhat resembled the flower of the calla lily.



(Fig. 16.) PROCESS OF FISSION IN STENTOR MÜLLERI.

The next change noticed was that at the bottom of the slit in the side the opening took a rounded form, so that the chain-like motion of the cilia looked (as a member of my family expressed it) as if a chain were running over a little pulley, and the cilia made a continuous fringe around the disk, down the body, and around the circular end of the slit, as shown in Figure 16 *b*.

The body now began to show a protuberant swelling immediately under the small circular opening at the lower end of the ciliated slit, and in a few minutes this enlargement equaled in diameter the previous thickness of the body of the Stentor at this point, thus doubling its size at the point of greatest expansion. The protuberance was distinctly on one side of the body, and appeared as an excrescence, the ciliated line running out to its apex, and the Stentor now showing the appearance outlined in Figure 16 *c*.

The swelling continued to increase, involving gradually the whole circumference of the body of the animalcule, the upper side of the protuberance assumed a sharper angle to the longitudinal line of the body, becoming more disk-like, while the line of the cilia enlarged so as to show an approach to the general form of the original head of the Stentor, the new oral opening gradually enlarging and deepening. Figure 16 *d* shows the appearance about a quarter of an hour later than that represented by Figure 16 *c*.

The slit line between the two disks now disappeared, and at the end of another quarter of an hour the upper portion of the body was attached to the lower by a connection no thicker than the tail of the original had been, though in each the disk was about one third smaller than the original disk, and the slope from it to the smaller part of the body below was much less

abrupt than in the usual stretched form of the animal when its disk is expanded. Figure 16 *e* represents its appearance at this time. The oral opening of the lower disk was now plainly seen to connect with the general internal canal by a circular orifice which varied in size, sometimes disappearing as if closed by a sphincter.

Up to this period of development the Stentor had kept its place, attached by its tail to the upper glass of the Wenham compressor, its body stretched at great length, its cilia in rapid and vigorous motion, the whole animal waving slowly or partially rotating on its longitudinal axis. Now, however, it quickly retracted with a spring like the recoil of a bit of stretched India-rubber, in the manner common to it and the smaller Vorticellæ which have long pedicels. The two parts of the body, or more properly the twin bodies, enlarged in diameter while shortening in length, and it was apparent that the mass of each was about equal to the other, although the lower part had been more than twice as long as the upper when the whole had been stretched at full length. The form of the parts was now almost exactly alike in each, and resembled the common bell-shaped Vorticellæ, such as *Vorticella campanula*, etc. In the retraction the internal canal, which now became plainly visible, also enlarged in diameter when relieved from the stretch, and appeared slightly convoluted. It passed out from the lower body just below the margin of the disk, and entered the upper body at its caudal extremity, apparently having only an extremely thin membranous wall at the point of junction of the two bodies. These bodies now began a sort of swaying and gyratory motion, the lower one still fast to the glass by its tail, and the upper one swinging slowly around, the umbilicus between the two becoming smaller and smaller as if twisted up. Figure 16 *f* is a sketch of the appearance at this time.

Suddenly the connection parted, and the two Stentors swam separately away, both assuming the common form of the animalcule when free-swimming, and differing from the original individual only in being of smaller size.

The complete transformation through all the stages I have noted occupied about two hours. I did not observe any internal difference of structure at the point where the swelling first began. No distinctly marked internal canal or sack could be seen when the body was stretched to its full length, but the manner in which it became unmistakably visible on the sudden retraction before the final separation of the parts looked strongly as if it had been there, but was drawn out to such tenuity as to be no longer apparent through the semi-translucent body.

Again, there was no doubt in regard to the fact that the ciliated line or slit extending from the disk down the body of the animalcule became apparent only after it had been some time under observation, and that the length and activity of the cilia along it increased rapidly within a very few minutes, so as to become a striking and marked feature of its appearance. This raises the question whether the fringe of cilia down the body, as described, is a specific characteristic of the *Stentor Müller*i, or is not rather a mark of the beginning of fission in all Stentors, — a question which an amateur naturalist may state, but will not presume to express an opinion upon.

In the instance above reported it is noteworthy that, except in the first appearance of the ciliated line down the body, there was nothing resembling a division by cutting or splitting. The body was of larger diameter than before, both above and below the new disk, when it first assumed the form of a protuberance with a ciliated circle on its anterior side ; and the subsequent diminution of the diameter of the body and tail of the upper individual was gradual throughout its length, through the stages shown by the drawings.

The observations were made with a quarter-inch objective of low angle, but excellent definition and penetration, with the B eyepiece, and the situation of the Stentor in the compressor was very favorable for an unobstructed view of the phenomena at all stages.

PRIMITIVE MAN.[1]

THE steady progress of discovery justifies the inference that man, in the earliest periods of his existence of which we have any knowledge, was at the best a savage, enjoying the advantage of a few rude inventions. According to the theory of evolution, which has the merit of being based on and not being inconsistent with observed analogies and processes of nature, he must have gone through a period when he was passing out of the animal into the human state, when he was not yet provided with tools of any sort, and when he lived simply the life of a brute.

No proofs, however, of man in this earliest stage have as yet been found, and the term "primitive man," if intended to be strictly applied, is at present a misnomer. The earliest traces thus far discovered do not reveal to us his beginning. This is still hidden in that mysterious past out of which he has emerged and into which neither science nor exploration has as yet pene-

[1] From the late Professor Wyman's Shell-Mounds of Florida.

trated. The ancient remains found in California, brought to the notice of the scientific world by Professor J. D. Whitney, and referred by him to the tertiary period, exhibit man as a maker of instruments for grinding grain, and other implements of stone, and, as far as an imperfect skull goes, essentially the same in his anatomical features as now. Or should those instances be set aside, as some geologists, waiting for further discoveries, are inclined to do, we still have remains from the gravels of the Somme in France, as well as the Ouse and other localities in England. Some of these last, Mr. Evans believes, date back to the time when the Needles of the Isle of Wight were connected with the mainland, the sea of Solent was the mouth of a river, and Britain was probably still a peninsula. The time since these conditions existed may not, he says, be estimated by years, but unquestionably extends back an immense period beyond that covered by history. The abundance of flint implements belonging to the gravels above referred to shows that man was then and there far from being primitive.

If the theory of evolution be true, and man was ever in a transitional or strictly primitive state, without tools or implements, it will be obvious that all the knowledge we can expect ever to have of him in this condition must come through the remains of his own body, older than his inventions, which will carry us back still further towards, if not to, his starting-point, as the geologist is carried back in time to the early period of the existence of animals. Even with regard to these, geology fails to reveal to us their actual beginning. Possibly the early remains of man may never be known, for during the revolutions which have taken place on the surface of the earth and the inroads which the sea has made upon the land, if a suggestion of Cuvier may be accepted, "the places where he [man] dwelt may have been utterly destroyed and his bones buried at the bottom of the existing seas."

It is almost certain that his bones, if simply left on the surface, would, like those of land animals generally, be soon entirely destroyed, either by the effects of the weather or by their consumption for food by wild animals. Nothing can be more striking than the complete destruction of the bones of the birds and reptiles, some of gigantic size, which once thronged the shores in the valley of the Connecticut River. Were it not for the preservation of their seemingly more perishable footprints, the mere knowledge that they once lived would not now exist. The same

is doubtless true of other kinds whose habitat was inland, and whole races of mammals and birds may have once existed of which no traces whatever remain, and this too within comparatively recent times. Keeping these considerations in view, it seems not at all improbable that the same fate may have befallen the remains of the earliest man.

As the ease with which food can be procured determines the habitat of animals, so also it determines that of man, and this naturally brings him to the shores of seas, lakes, and rivers, where it can be had with the greatest ease. It is hardly conceivable that he could, under any circumstances, at once have entered upon an agricultural or hunter life, since these both require expedients and inventions which long experience and education alone can give. Without tools or inventions of any sort, life in the forest, it would seem, would be for him almost impossible. Be this as it may, the wide geographical distribution of shell-heaps shows how generally man has been attracted by the kinds of food the shores yield, including not only shell-fish but fish and game, and the extent to which they have supplied his wants in his early periods. They are found at intervals along the whole Atlantic coast of the United States from the Bay of Fundy to the Gulf of Mexico, on the shores of California and northward to Behring's Sea, in Central America, the Gulf of Guayaquil, on the coast of Brazil, Patagonia, and Terra del Fuego, on the shores of England, Scotland, Ireland, France, and Denmark, in the Malay Peninsula, in Australia and Tasmania, and will doubtless be discovered in still other parts of the world.

Besides those just mentioned, other shell-heaps have been found on the interior rivers of the continent, especially the Mississippi and its tributaries. Atwater, who was the pioneer in inquiries relating to them, described the mounds of mussel shells on the banks of the Muskingum, containing various articles of human make, and LeSueur and Say explored a mound at New Harmony, Indiana, as early as 1826. Since then Dr. D. G. Brinton, Dr. Cox, Generals Humphreys and Abbott, and Professor C. A. White have described many other localities in the great Mississippi Valley where they exist in large numbers, and show how generally the habit of eating shell-fish prevailed in that region. In addition to the fresh-water shell-heaps of the St. John's, Florida, we have examined a well-defined shell-heap on the shores of the Concord, in Massachusetts, consisting of *Unio complanatus*, living specimens of which can be had from the river

near by. This shell-heap contains charcoal and pieces of worked bone and stone. It had been previously visited by the late H. D. Thoreau, who regarded it as an ancient Indian dwelling-place, though he published no account of it. Quite recently Professor Hartt, of Cornell University, has explored some of the interior fresh-water shell-mounds of Brazil, which are very extensive, selections from which are preserved in the Peabody Museum at Cambridge.

The study of the works of man from the oldest shell-heaps, the only records left of the progress their builders had made, tends to show that he was as far advanced at least as are the miserable creatures the traveler meets with now in the Straits of Magellan, or as are the Dyacks of Borneo, the Australians, or the Andaman Islanders. In other words, we have the life of man manifested now in a condition as primitive and no more advanced towards civilization than in the earliest prehistoric periods which have thus far been studied.

The only records we have of the earliest inhabitants of the St. John's River are the shell-mounds and the comparatively few implements they contain. Judging from these of the progress the natives had made, it is clear that they too had passed out of the primitive stage, had become hunters, had made some progress in the useful arts; and, however rude their implements, they were such as could only have been the result of long-continued efforts. They have left no signs of having learned the art of agriculture, but their tools, if they had any, may have been of a perishable nature. In the oldest mounds no pottery has been discovered, the builders of them no doubt having been ignorant of it. Though implements of wrought shell, bone, and stone are met with, they are not numerous, and those of stone from the interior of the mounds are quite rare.

The bones of animals obtained by hunting on land are in comparatively small numbers, so that, far as indications go, the older natives subsisted chiefly on fish and shell-fish. This is strikingly the case at the mound on Huntoon Creek, Osceola Mound, the mound next above Blue Spring, and at Horse Landing. Whether the inhabitants who built and dwelt upon the older shell-heaps, or even upon the later ones, were the same people the first explorers found occupying the shores of the St. John's is uncertain. The Indians who lived in Florida later had no traditions with regard to those who preceded them in remote times, nor is it to be expected that they should have, for they were not the descend-

ants of the original inhabitants, but were comparatively recent immigrants themselves. The early explorers make no reference whatsoever to the shell-mounds on the river, though they could hardly have failed to do so if these had continued to be occupied as dwelling-places, and the fresh-water shells were still to be used to any considerable extent as articles of food. They distinctly state that the natives lived by hunting and agriculture, describe the details of carrying on these operations, the preparation of dried meat, and mention the different articles, animal and vegetable, used, their mode of collecting food in granaries, and of preparing them; but nothing is said of the shell-fish. The inference is that the shell-mounds had already ceased to be occupied as dwelling-places, and that the natives had outlived the mode of life which gave rise to them, or had been replaced by others of different habits.

This conclusion is consistent with the fact that trees are now growing on some of the mounds, which are older than the discovery of America.

Unfortunately, we have no satisfactory means of making a comparison between the older and the later inhabitants, derived from parts of the human skeleton. There is an abundance of crania and bones taken from the burial-mounds, but it is hardly safe to assume that these represent the earliest dwellers on the St. John's. The bones from Osceola Mound and those from Rock Island, in Lake Munroe, are the only ones we have met with which can be claimed to be unequivocally contemporaneous with the earliest shell-heaps. The skull from the first of these places has anatomical peculiarities which differ from those of the skulls of the burial-mounds, but as there is but one, it may be exceptional.

The relation of the older to the later inhabitants, that is, of those dwelling on the St. John's centuries before and at the time of the first explorations, must remain for the present a matter of doubt. We need more complete explorations of the burial mounds than have as yet been made, and more complete anatomical comparisons of the crania and bones.

THE CAVE BEETLES OF KENTUCKY.

BY A. S. PACKARD, JR.

THOSE who have gone the rounds of Mammoth Cave, crossed the river Styx, with its muddy banks, passed through Fat Man's Misery, through the damp passages of the Labyrinth,

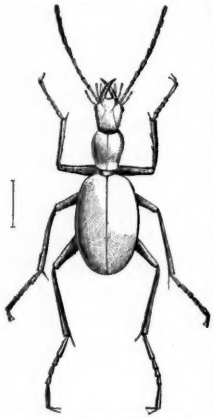
and lunched by Richardson's Spring, know that not a little discomfort is experienced in the course of the journey. But for the insect-hunter, who must spend hours on his knees in searching for the less common forms, or lie prone on his face on damp sand-banks, — the bed of the ancient stream which tunneled out these underground passages, — wearied vertebræ and knee-joints, the smoke and drippings of the oil lamps or candles, are the drawbacks which must be endured if he would be successful in his search for cave life. By two or three weeks' research in a few of the caves of Kentucky, in company with Professor Shaler, in charge of the Geological Survey of Kentucky, and with the aid of Mr. F. G. Sanborn, we were enabled to more than double the number of species of insects known to inhabit Mammoth and adjoining caves, and to discover a new and rich cave-fauna in the Carter caves in the eastern part of the State; while in examining Weyer's Cave, in Virginia, not known before to be tenanted by insects, some twenty species were discovered by the writer. The results of our researches on the spiders of these caves have already been given in the NATURALIST (ix. 274, 278), by Mr. J. H. Emerton and myself. In the present brief essay I propose to draw attention to the amount of variation in the cave beetles, and to the early stages of a few species, referring the reader for more details to papers hereafter to appear in the memoirs of the Geological Survey of Kentucky. It may here be said that the flies have been examined by Baron Osten Sacken, the beetles have been identified by Dr. J. L. LeConte, while the Amphipod crustacea have been identified by Prof. S. I. Smith, and papers on the Phalangids and other low arachnids and the mites are in course of preparation by the writer.

Of the two genera of blind beetles (*Anophthalmus* and *Adelops*) which occur in caves in Kentucky and Southern Europe, the smaller form is *Adelops*. Its appearance and habits are very different from those of *Anophthalmus*. It belongs to the family of burying beetles, or *Silphidæ*, the larger species of which are known to deposit their eggs in dead birds, mice, etc., previously burying them beneath the surface of the soil. The *Adelops*, however, is allied to a diminutive member of the family, *Catops*, the species of which live in fungi, carrion, or in ants' nests. The *Adelops* (Plate II., Figure 4, enlarged), named *Adelops hirtus* by Dr. Tellkampf, its original discoverer, is most abundant under loose stones at Richardson's Spring, where parties have for many years taken their lunch, the remains of which form a perennial

pasturage for these beetles. It is probable also that the dead bodies of bats, crickets, and smaller insects sustain them in other caverns and in different portions of Mammoth Cave.

The other blind beetles, various species of *Anophthalmus*, prey without doubt chiefly on living objects, perhaps the young of their own kind or of the *Adelops*, as they belong to the family of carnivorous beetles, the *Carabidæ*. They are found running over damp sand-banks, sometimes hiding in little pits under stones.

Six species of *Anophthalmus* are known, of which *A. Tellkampfii* is the largest and most abundant, occurring in Mammoth and the neighboring caves. Next to this, *Anophthalmus Menetriesi* of Motschultzy is most common. In the grottoes near Mammoth Cave, Cave City Cave, and Walnut Hill Spring Cave, near Glasgow Junction, Mr. Sanborn found *Anophthalmus pubescens* Horn. In Wyandotte Cave *A. tenuis* Horn and *A. eremita* Horn are the only blind beetles found, and the former has been found in Bradford Cave, Indiana, by Dr. John Sloan and myself. The larger number of species occur in the Mammoth Cave region, while in the Carter caves of Eastern Kentucky only one species (*A. pusio* Horn) occurred, which was originally discovered by Professor Cope in Erharts Cave, Montgomery Co., Virginia. No *Adelops* has occurred away from the Mammoth Cave region.



(Fig 17.) ANOPHTHALMUS.

The subject of the degree of variation in these cave beetles is an interesting one. So uniform are their physical surroundings: the perpetual darkness, even annual temperature, varying but very slightly winter or summer, unless in the smaller caverns; the dryness of the air, though after the spring freshets the caves are doubtless damper than at other seasons of the year (this may not be the case with Wyandotte Cave, which is remarkably dry compared with Mammoth Cave); all these conditions must certainly tend to produce much persistence of form and size in these beetles.

I will give a few notes regarding differences in size, to show how much variation does occur. In twenty-two specimens of *Anophthalmus Tellkampfii* (0.30 inch in length) from Salt Cave,

there was absolutely no difference from a number of examples of the same species from Mammoth Cave. Eleven *A. Tellkampfii* from White's Cave, a small cavern near the surface, did not differ in any respect from a number of Mammoth Cave specimens, both sets measuring 0.30 inch. Fourteen *A. Tellkampfii* collected by Mr. Sanborn in Sugar Bowl Cave, three miles northwest of Glasgow Junction, were the same as those from Mammoth Cave, but among them was some variation in size; the longest individual was 0.30 inch, the shortest 0.25 inch. Out of sixty-five *A. Tellkampfii* collected by Mr. Sanborn in Long Cave, nearly one mile from daylight, the longest was 0.30 and the shortest was 0.25 inch. Out of twenty-seven specimens of *A. Tellkampfii* from one locality in Mammoth Cave, the Labyrinth, the amount of variation was exceedingly slight, none being over 0.30 inch and the smallest 0.27 inch in length.

The smaller species of *Anophthalmus* seem to vary more than *Tellkampfii*, probably owing to the fact that the caves they occur in are in most cases smaller, nearer the surface, and therefore with a less equitable temperature and more sudden alternations of dampness and dryness. For example, of eighteen specimens of *A. tenuis*, the largest measured 0.20 and the smallest 0.16 inch, but there was less uniformity in size among these than in *A. Tellkampfii* from Mammoth Cave, for nearly a third were smaller than the others, while out of about eighteen *A. Tellkampfii* only one or two were dwarfed. Individuals of *Anophthalmus Menetriesi* (also a smaller species than *Tellkampfii*) from different caves, varied somewhat in size. The *Adelops hirtus* varies more in proportion than the species of *Anophthalmus;* thus of twenty-two examples all taken from the Labyrinth, the largest were 0.12 inch long, and the smallest 0.09 inch. Of this species two thirds were males. It appears, then, that there is a slight variation in size, and the main factor in bringing it about seems rather to be the want of sufficient food than any other cause. The tendency of variation is to a diminution of size, and this is generally among insects, where the climate is not extreme, owing to lack of sufficient food. And to the wanderer in these great grottoes the thought constantly presents itself to the mind, How do these insects, few and scattered as they are, get enough to live on? The perpetual hunger they must undergo was well illustrated in Wyandotte Cave, where, on kneeling in the path, one could see numbers of the common myriopod of that cave (*Scoterpes cavernarum* Cope) gathered around the hardened drops of tallow

which strew the pathways of that wonderful cave. One could almost hear them, in the stillness of the Titanic corridors and domes of that magnificent cavern, exclaim over a newly fallen drop of tallow from our candles, "Here 's richness!"

A few beetles were found in these caves which had evidently found their way in from out-of-doors, as they had eyes and did not differ from normal specimens. They are figured on the accompanying plate.[1] Figure 1 represents *Batrisus spretus* LeC. (much enlarged), one of the family *Pselaphidæ;* two females were found at the end of Dixon's Cave. It is a common beetle, and ranges from Vermont to Georgia, according to Dr. LeConte. Figure 12 represents *Quedius fulgidus* (much enlarged). It occurred in Dixon's Cave and also in Weyer's; it is a common species in the Middle and Western States. This and two other *Staphylinidæ* or rove beetles, represented by Figures 6 and 7, and a larva of this family (Figure 9) occurred in different caves and all had eyes, being evidently fresh arrivals in these subterranean retreats.

It was a matter of much importance to discover the larvæ, or young, of the blind beetles, the true autochthones of these caverns, in order to ascertain whether the young are born blind, particularly as the larvæ of these genera, so far as we know, had not yet been discovered in Europe. Systematic research in different caves soon revealed several larvæ, both of *Anophthalmus* and of *Adelops*. The young *Anophthalmus* occurred in several caves; particularly in Salt Cave, on damp sand-banks, under stones. Figure 3 represents what is without much doubt the larva of *A. Tellkampfii*. This larva is more closely allied to that of the European *Pterostichus nigrita*, figured by Schiödte, than any other form with which I have been able to compare it, but the body is rather slenderer, the head much longer and narrower, and the mouth-parts longer, while the caudal appendages are shorter. The end of the body is like those of *Harpalus* and *Stenolophus*, as figured by Schiödte, but the mandibles resemble those of *Harpalus*. There are no traces of eyes, and the body is white and

[1] Explanation of Plate II. Figure 1, *Batrisus spretus*. Figure 2, pupa of *Anophthalmus Tellkampfii*. Figure 3, larva of *Anophthalmus Tellkampfii;* 3 *a*, antenna; 3 *b*, labium and palpi; 3 *c*, maxilla and palpi; 3 *d*, labium. Figure 4, *Adelops hirtus;* 4 *a*, antenna of larva. Figure 5, larva of *Adelops hirtus*. Figure 6, a Staphylinid beetle. Figure 7, a Staphylinid beetle. Figure 8, an unknown blind Coleopterous larva from Bat Cave, one of the Carter caves. Figure 9, larva of a Staphylinid beetle. Figure 11, blastodermic cells of the cave spider, *Anthrobia mammouthia* (see NATURALIST, ix. 276). Figure 12, *Quedius fulgidus*. All the figures are magnified drawings.

rather soft, not chitinous as in most Carabid larvæ. There is no sculpturing on the head, and but a single claw on the legs.

At the same time and in the same sand-banks occurred the pupa (Figure 2, enlarged) of the same species. It rested in little pits or cells three quarters of an inch long under flat stones, and was eyeless and white, with the harder parts of the mouth honey-yellow in color.

Though the pupa of the *Adelops* was not found, two larvæ occurred, one in the Labyrinth of Mammoth Cave. Figure 5 represents this interesting form, and 4 *a* one of the antennæ magnified. It bears some resemblance to the larva of *Agathidium* (I know of no figure of a young Catops with which to compare it), but the head is very much larger and nearly as wide as the prothoracic segments. The body tapers rapidly from the prothorax to the end, and is provided with long hairs; it is dull white. There are no traces of eyes.

UNIVERSITY INSTRUCTION IN BOTANY.

BY PROFESSOR W. G. FARLOW.

WITHIN the last few years the interest of the public in botanical questions has very much increased, and not only is there a greater demand for popular lectures, but the introduction of the study of botany into the common schools is beginning to be seriously agitated. But who is to teach the subject? If the public desire to have botany taught in the schools, it is not, as some botanists seem to suppose, because they regard botanical facts as more important than other facts, — historical, philological, etc., — but because, of all the natural sciences, botany is the most easily and cheaply adapted to the school-room, and it is to natural history in some form or other that the public look for a remedy for the evil of book-cramming and memorizing which prevails in our schools. But although botany may serve to counteract the evil, it will not accomplish that object unless in the hands of good teachers, and the very first requisite of a good teacher is a familiarity with the subject he is to teach. If the introduction of botany into the schools is precipitated, the instructors will necessarily be those who are already overburdened with other branches which they are obliged to teach, and which furthermore they teach in exactly the way in which botany or any other natural science should never be taught. The school-teachers themselves must be taught, and that will not be an easy task,

considering how little time they have for study, and how many of them have reached an age when entering upon new habits of thought is not easy. Evidently, if there is to be any instruction in botany in the schools which shall amount to anything, it must come from those who have studied the subject at college, for it is in the universities that botanical experts are found as instructors, and it is only there that any systematic and continued study of the subject can be attempted. Let us see what sort of botany is taught in the universities, and whether any improvement is needed or to be desired.

In many of our universities, and we are not now speaking of agricultural colleges, which must be classed with technical schools rather than with universities, the study of botany is elective, and it would not be far from correct to say that it is chosen by a moderately large per cent. of students for a single year, and continued by a much smaller number, perhaps a third or a quarter, during a second year. In all our colleges, whether botany is compulsory or elective, the students are not required or supposed to have any previous acquaintance with the subject, and in all, the first step is to recognize the organs of flowering plants and to learn their names. As soon as possible, the student is requested to provide himself with a manual; a number of flowers, from the field or the hot house, as the season serves, is then placed in his hands, and he is required, if we may be allowed the expression, to "go through" them. This last process varies somewhat with the fancy of the instructor and the laboratory facilities of the college. Where the botanical chair is combined with those of zoölogy, chemistry, and the modern languages, the "going through" consists in tracking a flower, just as though it were a thief or a woodchuck, to its hiding-place in the manual by means of a key. A neat pencil mark against the specific name serves to indicate one step onward in the mental development of the student. In those colleges where there is a greater division of labor, and one man is obliged to teach only botany and zoölogy, there is generally provided a printed schedule in which the student as he proceeds records the number of stamens and pistils, the interesting fact whether the ovary is superior or inferior, and other similar details, until, having filled his schedule, he is at liberty to turn to the key and follow the course we have previously described.

In a few colleges, during the first year, students of botany, in addition to the analysis of flowering plants, hear a few lectures

on cryptogams or vegetable physiology, but the great fact is never lost sight of that the aim and end of all botanical instruction is, at the end of a year's study, to be able to take one's manual, and, with a certain degree of facility, find the names of common flowering plants. That is the first task to be accomplished, and not until it is accomplished is any student to be allowed to take up anything else. As a matter of fact, comparatively few students pursue the subject for a second year, if by the university regulations they are allowed to give it up; and the question suggests itself, What is the result of a botanical course of one year? The good students who have, under the circumstances, made the best possible use of their time, are able to analyze simple flowering plants with tolerable ease, and know the characters of some of the orders of phænogams; and those who have not studied so faithfully are perhaps able to explain to a cruelly skeptical father that a rose-bush is very much like an apple-tree, or to compare notes with Emily, who has just returned from Miss Smith's Institution for Young Ladies, and, after some months' study, is not quite sure whether the calyx is inside or outside the petals.

We must confess that it seems to us a mistaken notion to teach botany as though the naming of phænogams, or even the general morphology of phænogams, was any more important than other topics. We know from experience that but a very small per cent. of the students who study botany in college ever do learn enough to enable them to analyze flowers with any ease, and that even the few who can, rarely continue the study after leaving college, from want of either time or opportunity for herborizing. The botanical students in any university may be divided into three classes: those who have a passion, a natural aptitude, for the subject, whose number is always very small, and includes those who are to become the experts and higher teachers of botany; those of good ability and industry, who elect botany because they hope to find it an aid afterwards when they shall study a profession or become school-teachers; and those who select the study as part of a plan of general culture and improvement. There is a fourth class, but we never mention that, composed of young gentlemen whose principal aim in coming to college seems to be to get as little good out of it as possible. We should like to know which of these three classes is benefited by the almost exclusive study of phænogams for the first and, in the case of many of them, the only year of their botanical studies. Those who wish for general culture get a smattering of the tech-

nicalities of one branch of the vegetable kingdom, and are in absolute ignorance of all the rest. Those who think a one year's course, as at present arranged, will help them as teachers, will find themselves without a general notion of the vegetable kingdom, without which it will not be easy to instruct others. The medical man will find that he would be able to recognize several useful plants were it not for the fact that they do not grow within several hundred miles of his home, and, on the other hand, that he has no knowledge either of vegetable histology, which would be a great assistance in his pathological studies, or of fungi, which are interesting in connection with the origin of several diseases.

If we look at the effect of the usual training on the first class we have mentioned, those who really wish to become botanists, the conclusion we must draw is not flattering. Why is it that so few botanical workers are found in this country? Where are the young men of ability and enthusiasm who ought to be working up some of the interesting botanical questions? They are all — studying zoölogy. As botanists, we cannot of course admit that botany is in itself any less interesting than zoölogy, and if we turn to Germany, for example, we find that the proportion of young men who enter on a botanical career there is as large as that of those devoting themselves to zoölogy. If at the present day we are feeling the want of young botanists to investigate or instruct, we must not forget that at the door of every botanical lecture-room the would-be enthusiast has encountered a manual of flowering plants, through which he must make his way if he would see any light beyond. What wonder that many were attracted to the other house, where manuals were not so much in vogue, and the study of development encouraged. It must be said with shame that not a single work on the development or minute histology of any plant or group of plants has ever been written by an American, if we except some of Sullivant's bryological works. It has finally become the prevailing belief that if one would do anything for botany he must find or make new species. It is certainly of the greatest importance that eventually all species of plants should be described, but it is very injurious to have one who has not a large library and herbarium attempt to decide what is new and what is not.

We would by no means disparage the systematic study of phænogams, but by conveying the idea that such a study underlies and is the key to the whole science of botany, numbers

of young men whose talents and services could ill be spared have been driven to other branches of natural history. The great mistake seems to us to have been that it has been attempted to educate all who study botany as though they intended to become botanical specialists in the department of descriptive phænogamy, whereas not one in a thousand has such an intention or desire.

We would see the instruction in botany for the first year rather directed to give a good general view of the whole vegetable kingdom, than to enable the student to follow out specific analysis in any one department. We would not forget that botany is one of the divisions of biology; we would, as far as possible, examine plants in action, and would let the student devote his time for the first year to the examination of a few illustrations of the different types of vegetable life, from the highest to the lowest, without any attempt at teaching particular genera and species. We would teach the student how to investigate for himself, and avoid imparting any encyclopædic knowledge. At the close of one year's study the student would be in a condition to know in which direction he prefers to work, and in his second and later years of study he could pursue more and more in detail the department which his own taste may dictate, not, however, entirely neglecting others. We think it absolutely necessary that in the first year of study a general course should be pursued, in which the student should be obliged to think for himself, and should not be allowed to depend on books.

To enter into particulars, we should prefer something of this kind: We suppose the college term to begin about the first of October and end the first of the following July, and that the student spends three hours a day for three days in the week in the laboratory, or, in case a lecture is given on any day, only two hours of laboratory work. The material is selected to suit the climate of the Northern States.

October and November. — One lecture a week. (A.) Illustrations of *Palmella*, *Nostoc*, *Oscillaria*, *Desmids*, *Spirogyra*, etc., to show the structure of the cell, and acquire facility in the use of the compound microscope and in making preparations.

(B.) *Myxomycetes*, to examine the plasmodium. *Nitella*, to show the movements of protoplasm.

(C.) *Mucor Syzygites*, to illustrate conjugation.

(D.) *Peronospora viticola*, to show oöspores and zoöspores.

December, January, and February. — (A.) *Basidiomy-*

cetes, illustrated by *Agaricus*, *Lactarius*, *Corticium*, etc., alcoholic material, to show structure of mycelium and hymenium.

(B.) *Ascomycetes*, showing ascospores, conidia, pycnidia, etc., illustrated by *Eurotium*, *Phyllactinia*, *Microsphœria*, *Peziza*, *Morchella*, *Sphœria morbosa*, *Sphœria herbarum*, *Hypomyces*, etc.

(C.) Lichens of different kinds.

(D.) *Fucus*, *Laminaria*, *Ectocarpus*, *Polysiphonia*, *Callithamnion*. (These last can be obtained alive in winter by those living near the sea-coast, and all except Fucus can be kept perfectly well in alcohol.)

The subjects just mentioned for December, January, and February should occupy two days out of the three, part of the time being spent in attending lectures and part in laboratory work. The third day, the organography of flowering plants should be studied.

MARCH. — (A.) Ferns and mosses, structure of prothallus and fruit, one day in the week.

(B.) Vegetable physiology, one day.

(C.) Organography of flowering plants, one day.

APRIL, MAY, AND JUNE. — One day a week to histology of higher plants. Two days to analysis of flowering plants. With a certain number of lectures on vegetable physiology, and in early summer a glance at the *Uredinei*, illustrated by acidial and uredo forms and dried material of teleutospores.

Such would be the course which we should advise for a person old enough, and with sufficient previous training to be admitted to college. For persons in their first and second childhood, kindergarten methods will do very well, but for young men we prefer work. The course we have laid down requires work with the compound microscope from the very beginning. There is no denying that the microscope has caused a revolution in botany, and no botanist of the present day, no matter what department he may take up, can afford to be ignorant of the practical working of that instrument. Vegetable histology is the very A B C of botany, and no botanical work can be solid unless it rests on that foundation. To be sure, the microscopical societies have done their best to bring the microscope into disrepute, by encouraging the notion that there is a department of microscopy apart from botany, zoölogy, and patholcgy, and by striving to recommend to the public large and expensive instruments, which, however perfect they may be optically, are ill adapted for steady work and

for the slender means of most young people. The microscope as an optical instrument comes under the province of physics, and microscopy is no more a science apart from biology and pathology than is cutlery. We might just as well have a department of cutlery in which we could include those animals and plants which are usually studied by sections made with razors and knives. Every college where botany is taught should be provided with a number of compound microscopes. Microscopes sufficiently good for ordinary purposes can be purchased in Europe for thirty dollars gold, or even somewhat less, and can be imported free of duty for college use. Even with duty paid, fifty dollars ought to secure a very fair French or German microscope.

Our proposed course implies a tolerably large proportion of laboratory work, and we may be allowed here to say a few words on what seems to be a growing evil in this country, the abuse of laboratories. A few years ago, when it was seen that instruction in natural history could not be imparted successfully from books alone, laboratories were introduced to remedy the evil. It was said, In the laboratory the student will see the object itself; he will learn to compare, to reason, and, instead of merely committing a number of pages to memory, he will have a practical knowledge of the subject. But the laboratory system has worked in a curious way, although in a way which might have been anticipated, and it has not proved such a complete panacea as had been expected. If, on the one hand, to those who are anxious to learn and are fond of investigation, laboratory exercises are of incalculable value, it must be said, on the other hand, that the average American student is thoroughly impressed with the idea that, if he does not understand a thing at once, it is the business of the instructor to explain it to him. It never occurs to him that it may be for his advantage to work the thing out himself. From childhood up, having been taught that education consists in the acquisition of facts, he cannot see that the mere process of acquiring a fact may be of more importance than the fact itself. But the case is even worse. The fourth class of students which we described, those who wish to have as easy a time as possible, regard the laboratories as especially created for the purpose of escaping study, and to the laboratories they flock in crowds. They seriously interfere with the work of the good students, by compelling the instructor to spend a great part of his time in explaining things which they ought to work out for

themselves. If a shirk is a nuisance in the lecture-room, he is tenfold a nuisance in the laboratory, where he wastes not only time, but room and working materials.

Were the courses in our colleges elective, in the true sense of the word, this difficulty of the crowding of laboratories by students who are not in earnest would not arise. But even where the botanical course is nominally elective, there is a certain compulsion employed in the form of check-lists or compulsory recitations. As it is, we see no other way out of the difficulty than to divide a botanical class of any size into two sections; one including those who are willing to work, who should have laboratory privileges; the other including the shirks, who should be required only to attend lectures and recitations, and who should, of course, be marked on a lower scale. There is no good reason why a college should provide laboratory room and equipments for those whose principal object in going to the laboratory is to try to worm out of the instructor the questions of the next examination paper. There is another class of well-meaning but exasperating students, birds of passage we must call them, who have usually not more than fifteen or twenty minutes to spend at any one time in the laboratory. We see no reason why, if a student actually has no time at his disposal, he should be allowed to throw a laboratory into confusion by a series of abrupt entrances and as abrupt departures.

We have purposely omitted any lectures on economic botany from our proposed course. However useful a study it may be for apothecaries, it is entirely unadapted to college students. They might just as well try to learn so many pages out of the dictionary. It would be very desirable to remember the names and orders of a large number of useful and injurious plants. But no one ever does who is not obliged to lecture twice a year on the subject, and even then he is compelled to refresh his memory by frequent perusal of certain books whose titles we will not mention, for fear that it may be said that we are betraying professional secrets.

In Germany the botanical professors generally give a principal course of lectures, which is attended by those who are paying particular attention to the science, and a shorter accessory course, on some limited subject, which is attended by those who simply wish to know what is going on in the botanical world, without making any detailed study. It seems to us that something similar would be advisable in this country. There is

always a number of students who would like to hear a few lectures on some of the most interesting topics relating to botany, students intending to become clergymen, lawyers, business men, whose time is so occupied with historical or philosophical courses that they could not take a regular botanical course. The few minutes which they could spend in a laboratory would be time thrown away. They want a few plain lectures on some limited topic, and the topic should be changed from year to year. On one year there might be, for instance, six lectures on fertilization of higher plants. The next year a course on the lower limit of the vegetable kingdom. Or there might be two or three courses of six lectures during the same year.

RECENT LITERATURE.

A Few Suggestions on Tree-Planting.[1] — The increased interest awakened of late in arboriculture may be attributed in part to a realizing sense that we have been forest-spendthrifts, and that it is about time for us to begin economizing, and if possible repair our wasted patrimony. There is a vague fear that certain dangers are impending over us as a penalty for recklessly clearing the timber lands, and there seems to be a very general wish that our neighbors should do something at once. Now, what to do and how to do it are not so clear.

In a course of lectures last winter at the Lowell Institute, Dr. Hough gave a frank statement of the difficulties. In the Eastern States the traditions of two hundred years are against tree-planting; there is no concert of action in any community; there are many contingencies which may render the scheme in any one case a very hazardous one, and there is, at all events, a long time to wait for any pecuniary profit.

Besides these difficulties we may state another, namely, that in few towns are the assessors of taxes in a right frame of mind. And so each man would gladly see his neighbor do something at once. This little pamphlet by Mr. Sargent gives many sensible hints as to what to do, and we call attention to the paper because it is a practical one, advocating practicable methods. Meanwhile, as our communities are acting on Professor Northrop's suggestion to plant centennial trees in the towns this year, can they not try a few centennial forests?

Die Pflanzenwelt Norwegens.[2] — This work is in two parts. The first, published in 1873, is a general account of the physical features of Norway and Sweden, with particular reference to the distribution of

[1] *A Few Suggestions on Tree-Planting.* By C. S. Sargent, A. B., Director of the Arnold Arboretum of Harvard University. From Report of Massachusetts State Board of Agriculture, 1875.

[2] *Die Pflanzenwelt Norwegens.* Von Dr. F. C. Schübeler. (The Vegetation of Norway, by Professor Schübeler, of the University in Christiania.)

wild plants and the cultivation of the useful ones. The second part bears the date 1875 and is more special in its nature, being in fact a popular flora of Scandinavia. The volumes are interesting throughout. We shall hope to transfer to our General Notes some of Professor Schübeler's statements respecting the remarkable climate of Norway, and the occurrence of Southern plants near the Arctic circle.

Botanischer Jahresbericht.[1] — Annual Report on Botany, by Dr. Just, of Carlsruhe. The second year of this valuable compendium is an improvement on the first. The several departments of botany are conducted by different men, chiefly specialists, and in a careful manner. The articles which have appeared in the journals, and proceedings of societies, are given in abstract. Besides these there are very good critiques of the botanical books for the year (1874). The Year-Book is of great value to all botanists who wish to keep up with the published researches, and who have not time to study all the journals. It must be said, moreover, that the range of periodicals from which Dr. Just and his associates have selected their notes is very wide, comprising many chemical and agricultural journals, which are not likely ordinarily to fall in a botanist's way. Technologists and chemists have had their annuals for several years, and it is high time that botanists should fare as well. Botanists ought to congratulate themselves that the task has fallen into such good hands, and they should see to it that the enterprise is sustained.

Kneeland's American in Iceland.[2] — This little book, issued about the same time as Judge Caton's Summer in Norway, affords fresh evidence that American tourists are taking more interest than formerly in Northern Europe, particularly the Scandinavian peninsula and the islands to the westward, the homes of the Northmen. Dr. Kneeland's book is an intelligent and by no means dull account of Iceland, preceded by pleasant sketches of the Orkney, Shetland, and Faroe Islands, as seen during a voyage of a few weeks in 1874, the year of the thousandth anniversary of the settlement of Iceland by the Northmen.

Our readers will examine with much interest the chapter on the Physical Characters of Iceland, in which the author adopts the view that Iceland was uplifted towards the end of the glacial epoch, and that this explains the traces of a milder climate in Greenland before the advent of man. At present the geographical position of Iceland is therefore very important, as "with Jan Meyen and Spitzbergen it forms a natural barrier against the desolation of Northern Europe by the ice from Arctic regions; should Iceland disappear beneath the waters, Nor-

[1] Berlin: Gebrüder Borntträger, 1875, 1876.

[2] *An American in Iceland.* An Account of its Scenery, People, and History. With a Description of its Millennial Celebration in August, 1874; with Notes on the Orkney, Shetland, and Faroe Islands, and the Great Eruption of 1874. By Samuel Kneeland. With Map and Nineteen Illustrations. Boston: Lockwood, Brooks, & Co. 1876. 12mo, pp. 326. $2.50.

way would have the cold of Greenland, the north of England would become frozen, and Greenland would be green again."

Now that we have in Montana the Yellowstone Park, with its hundreds of geysers, some throwing loftier streams than the Great Geyser of Iceland, which sends a shower not over one hundred feet high, the Haukadaly Valley of Iceland must hereafter assume a more modest place in our geographies. But for many years more travelers will see

ERUPTION OF STROKR, AUG. 5, 1874.

(FIG. 18.)

the geyser of Iceland than those of Montana. Our figure (18), kindly loaned by the publishers, illustrates the Strokr or "churn" geyser, after it has been irritated "by pouring a cart-load of sods down its capacious

throat." The column of water is about one hundred feet high, and while the geyser is recovering from the effects of this novel emetic we leave the subject of Iceland and its sensitive interior.

HASSARD'S FLORAL DECORATIONS.[1] — This little manual seems to us to be quite novel in some of its features, and certainly very attractive. It will afford many a new suggestion, and the hints are in good taste. We select the titles of a few chapters to give some idea of the scope of the work: Preparing Flowers, Wiring Flowers, Gumming Flowers, Keeping Prepared Flowers Fresh; Plants through the Table, Decorations for Buffets; Table Decorations for Christmas Day; Arrangement of Fruit for Dessert; Vases for the Breakfast-Table; Vases for the Drawing-Room; Button-Hole Bouquets and Coat Flowers; Pot Plants in Rooms; Window Gardening, Hanging-Baskets, Fern-Cases, Stands of Plants; Plant-Stands for Halls; The Grouping of Plants in Rooms.

RECENT BOOKS AND PAMPHLETS. — Myths of the New World. By D. G. Brinton. Second Edition, revised, from New Plates. New York: Henry Holt & Co. 8vo. $2.50.

Angola and the River Congo. By Joachim John Monteiro. With Map and Illustrations. New York: Macmillan & Co. 1876. 12mo, pp. 354. $2.50.

Contributions à l'Histoire de la Vésicule germinative et du premier Noyau embryonnaire. Par Édouard van Beneden. Bruxelles. 1876. 8vo, pp. 50. With a Plate.

Beobachtungen über die Arten der Blatt und Holzwespen. Von C. G. A. Brischke und Dr. G. Zaddach. 4to, pp. 23–89. 1875. With Three Plates.

Birds. (From the Encyclopædia Britannica, ninth edition, iii. 728–778.) By Alfred Newton. 4to.

Geological Survey of Alabama. Report of Progress for 1875. By E. A. Smith. Montgomery, Alabama. 1876. 8vo, pp. 220.

Geological Survey of New Jersey. Annual Report of the State Geologist for the Year 1875. By Geo. H. Cooke. Trenton. 1875. 8vo, pp. 41. With a Map.

The Affinity of the Mollusca and Molluscoida. By W. K. Brooks. (From the Proceedings of the Boston Society of Natural History, xviii. 225–235, 1876.)

Botanical Articles. By Prof. W. G. Farlow. Extracted from the Bulletin of the Bussey Institution, March, 1876. 8vo, pp. 404–454. With Six Plates.

Bulletin of the United States Geological and Geographical Survey of the Territories. Vol. ii., No. 2, Art. 1. Studies of the American Falconidæ. By Robert Ridgway. Art. 2. Ornithology of Guadaloupe Island. By Robert Ridgway. Washington, D. C. April 1, 1876. 8vo, pp. 91–195. With Two Plates.

Notes on the Locust Invasion of 1874, in Manitoba and the Northwest Territories. By G. M. Dawson. Montreal. 1876. 8vo, pp. 16. (From the Canadian Naturalist.)

Bulletin of the Museum of Comparative Zoölogy. Vol. iii., Nos. 11–14. Cambridge. March 27, 1876. 8vo, pp. 273–348.

Transactions of the Kansas Academy of Science. Vol. iv. Topeka. 1875. 8vo, pp. 63.

[1] *Floral Decorations for the Dwelling-House.* A Practical Guide to the Home Arrangements of Plants and Flowers. By ANNIE HASSARD. American Edition, revised. With many Illustrations. London and New York: Macmillan & Co. 1876. 12mo, pp. 166. $1.75.

GENERAL NOTES.

BOTANY.[1]

On the Rate of Movement of Water in Plants. — This subject has been frequently investigated since the time of Hales and Bonnet. Professor Sachs, of Würzburg, gave, as the result of his observations, the rate of 23 centimetres an hour. McNab, in 1871, made use of a solution of a salt of lithium, and traced it in its course through the plant, coming to the conclusion that the rate was 46 centimetres an hour. These values are regarded by Sachs himself and others as too low. The methods are regarded by Professor Pfitzer, of Heidelberg, as unsatisfactory, and he suggested in 1873 another which yielded very remarkable results. He allowed the soil in some flower-pots containing plants to dry so far as to cause drooping of the leaves. Then he noted the position of the leaves by means of needle points, and watered the soil freely. The leaves recovered their former positions rapidly, and the times were observed. The rate of 5 metres an hour was the highest noted. In *Justicia Adhatoda* leaves 25½ centimetres above the ground moved in three minutes after the soil was watered. In 1874 McNab repeated the lithium experiments and obtained a higher rate than before, nearly 40 inches in the hour. Looking upon this as too low, Pfitzer has again experimented, this time with lithium nitrate. The water employed contained one half of one per cent. of the salt. The plants used were cut under the solution, and the cut end immersed therein for a while. Upon removal the plant was cut in lateral halves from above downward, and the parts were tested spectroscopically. Twigs of Philadelphus gave 4½, Amarantus 6, and Helianthus 10 metres in the hour. The highest rate observed was in the case of a sunflower with leaves in bright sunlight; here it was 22 metres in the hour. The results of later observations are promised.

The Influence of Light on the Color of Flowers. — It was shown by Sachs a dozen years ago that the blossoms of many plants can develop normally in perfect darkness. Plants which have a good supply of elaborated material stored up in bulbs or tubers were observed to have flowers of normal shape and color, even when all the leaves had grown and the flower-buds opened in a dark room. If the buds are inclosed in opaque cases, but the leaves exposed to sunlight so that assimilation is unhindered, the color and shape of the flowers remain normal. There were noticed by Sachs a few slight exceptions. Common nasturtium blooming in the dark had flowers more yellow than usual; wall-flower had smaller and brighter yellow blossoms than those which opened in the light; scarlet-runner, brilliant flesh-red flowers; large snapdragon, usually having flowers of deepest red, had, when blooming in the dark, corollas which were white blotched with rose, and on the

[1] Conducted by Prof. G. L. Goodale.

lower lip had a sulphur-yellow spot. Sorby, in 1873, showed by the spectroscope that diminution in the amount of light prevents the formation of red coloring matter in the corolla of wall-flower, and changes the character of the yellow coloring matter. Askenasy was familiar with these facts last summer when he commenced a series of experiments, the results of which have just been published. He concludes that many flowers need the light in order to acquire their normal color, but others are quite independent of it. This difference may be referred in some cases to defective nourishment of the plant kept in darkness, but this cannot explain all. The observations can be so easily made that we suggest to our readers a repetition of some of the experiments. The plants which gave the most striking results were *Prunella*, *Silene*, *Antirrhinum*, *Pulmonaria*, *Hyacinthus*, and *Tulipa*.

Tolmiæa Menziesii, of Oregon (a curious rather than handsome saxifrageous plant, related to *Tiarella*), propagates naturally and freely by adventitious buds, produced at the junction of the leaf-stalk with the blade, in the manner of *Begonia*. We have five live plants that show this, sent by Elihu Hall, of Illinois, who calls our attention to the peculiarity. He states that any of the leaves may be taken off and used successfully for propagation. — A. Gray.

Mr. W. F. Flint sends good specimens of *Astragalus Robbinsii* Gray, from the limestone region about Queechy, N. H.

Rate of Growth of Agave Scapes. — July 10, 1870. I measured a scape of *Agave sisalensis* to-day, and made two transverse slits with the point of my knife, six inches apart, one above the other, and not far from tip of scape.

July 17th. The tip of scape is to-day 41½ inches higher than it was on the 10th, and the upper incision is 3½ inches and the lower one ⅞ of an inch higher than they were on same day.

July 22d. Three other plants measured to-day, whose scapes are respectively 30, 20, and 16 inches high.

July 25th. In the last seventy-two hours the scapes have grown in height 17⅞, 12¼, and 10½ inches, respectively.

Two transverse incisions were made, one 13¼ inches from the apex of scape, the other 18 inches below this; the upper one has ascended 3½ inches, and the lower one but $\frac{3}{16}$ of an inch.

July 29th. Scape of No. 1 has ascended (its tip) in the last six days 39 inches, and No. 2, 24 inches. (No. 3 was not measured.)

August 5th. Tip of scape of No. 1 has ascended in fourteen days 71 inches, and No. 2, 70 inches.

August 22d. No. 1 has, in thirty-one days, ascended 12 feet and three inches, and No. 2, 12 feet and two inches. — N. B. Moore, Manatee, Fla.

The Teeth of Green Leaves as Organs for the Secretion of Nectar. — The fact that green leaves secrete a saccharine matter

has been known since the announcement by Conrad Sprengel, in the last century, that on the stipules of certain *Vicias* there are secreting spots. Schlechtendal, in 1844, described the secretion of "sugar" by the leaves of *Clerodendron* and *Viburnum Tinus*. Unger noticed "sugar-glands" on these and on *Acacia longifolia*. Caspary found similar glands on many plants, but it appears to have been Haustein who first thoroughly investigated their structure. He thought the glands were in most cases modified trichomes or plant-hairs. Reinke has lately reviewed the whole subject, and finds that in addition to the sugar-spots and sugar-hairs there are also modified serrations of the leaf-blade in many plants, which serve as organs for secreting matters; in some cases the exudation is of a saccharine character, but often of a mucilaginous nature. *Prunus Avium* and some other species of *Prunus*, *Kerria Japonica*, *Rosa centifolia*, *Cydonia Japonica*, *Betula alba*, and many other plants are spoken of in his memoir as possessing leaf-teeth which secrete freely. A few plates accompany Reinke's paper.

Botanical Papers in Recent Periodicals. — *The Journal of Botany, British and Foreign*, March, 1876. On New and Rare Fungi, by W. G. Smith, F. L. S. Two New *Amaryllidaceæ* from Natal, by J. G. Baker, F. L. S. On the Genus *Syringodea* (in Order *Iridaceæ*), by J. G. Baker, F. L. S. The Apetalous Fuchsias of South America, by W. B. Helmsley. Some Contributions to Plant-Chemistry, by A. H. Church. (Analyses of lettuce, Irish moss, water-cress, beech-scales, elm-flowers, outer layers of wheat-grain.) A list of new species of flowering plants in periodicals published in Great Britain during 1875.

Proceedings of the Royal Irish Academy, January, 1875. On Heat as a Factor in Vital Action (so-called), by Geo. Sigerson, M. D. (Concerning the effect of heat on cyclosis, etc., and on the motion of latex.) April, 1875. On the Apothecia of certain Algæ, by William Archer. On a new Fresh-Water Sarcodic Organism, by William Archer. List of Seychelles Myrtaceæ, by J. G. Baker, July, 1875. On the Structure of the Leaves of certain Coniferæ, by Prof. W. R. McNab. (A reëxamination of the microscopic anatomy of the section *Tsuga* of the genus *Pinus*. With plate giving cross sections of the leaves of the six species.)

Botanical Bulletin (Hanover, Indiana), March, 1876. Chia, by Dr. Rothrock. ("Chia" is a mealy preparation made from the roasted seeds of *Salvia Columbariæ*. The meal mixed with water is used as food and as a demulcent drink. Quantities of this seed have been found buried in graves several hundred years old, a fact which indicates that its use is of great antiquity.) Notes on Gramineæ, by A. H. Young.

Comptes rendus, No. 3. A. Müntz, On certain Changes in the Cane-Sugar of Cane-Juice. No. 5. Heckel, On the Spontaneous Periodic Movement in the Stamens of *Saxifraga sarmentosa, umbrosa, Geum acanthifolia*, and in *Parnassia palustris*. The relations of this phenomenon to the arrangement of the floral organs.

Flora, No. 2. Hugo de Vries, On Wood-Tissue which repairs Wounds (not finished). A. Geheeb, On certain Mosses. No. 3. A. de Krembelhuber, Brazilian Lichens. Hugo de Vries, On Wood which repairs Wounds (not finished). Stephan Schulzer, Notes on Fungi. No. 4. Continuations of the foregoing.

Botanische Zeitung. Reinke's paper on Investigation of Growth is continued in the numbers since our last notice, and down to No. 10, March 10th. The paper is of great interest, and will be noticed at some length in the June NATURALIST.

ARBEITEN DES BOTANISCHEN INSTITUTS IN WÜRZBURG, herausgegeben von Professor Dr. Julius Sachs. We resume our notice of this volume of Botanical Contributions from the Würzburg Laboratory with the third part, which begins with a paper by Dr. Hugo de Vries, On the Wilting of Cut Shoots. (De Vries has clearly pointed out the marked difference in effect between cutting shoots under water and severing them with exposure of the cut surface to the air. The former shoots wither far less than the latter.) IX. Hugo de Vries, On Growth in Length of Tendrils which curve on the Upper or the Lower Side. (The effect of irritation to change the rapidity of growth is not local, but is felt in certain cases throughout the tendril. The effect is often continued after the removal of the irritant or the body in contact.) X. Hugo de Vries, On the Mechanics of Living Plants. (Abstract given in Sachs' Text-Book, page 777.) XI. Dr. Emil Godlewski, Dependence of the Elimination of Oxygen from Leaves on the Amount of Carbonic Acid in the Air. (1. Increase in the amount of CO_2 in the air up to a certain limit favors the evolution of oxygen; above this limit it is more or less injurious. 2. This limit varies for different plants: for *Glyceria spectabilis* on clear days, between eight and ten per cent.; for *Typha latifolia*, between five and seven per cent.; for oleander a little lower. . . . 5. Increase in intensity of the light increases the evolution of oxygen.) XII. Dr. K. Prantl, On the Influence of Light on the Growth of Leaves. (Attributing the difference between growth in light and growth in darkness to the pathological condition induced by absence of light.) XIII. and XIX. Professor Sachs, On the Growth of Tap and Side Roots. (An interesting and elaborate memoir, to be hereafter given in abstract in our General Notes.) XIV. Dr. Hermann Müller (Thurgau), On the Protonema and Rhizoids (root-hairs) of Mosses. XV. Dr. Oscar Brefeld, On Alcoholic Fermentation. XVI. Dr. Hugo de Vries, On the Extensibility of Growing Shoots. XVII. Dr. K. Prantl, On the Renewal of the Growing Point in the Roots of Angiosperms. XVIII. Dr. R. Pedersen, Have Variations in Temperature, as such, an Unfavorable Influence on Growth? (Answered in the negative.)

In closing this sketch of the first volume of Contributions from the Würzburg Laboratory, we must be allowed to call attention to an important and excellent feature of the publication, namely, the summary at

the end of each article. This has long been the practice of French writers. Its adoption in a work like this gives an increased value which we are all quite ready to appreciate. Furthermore, we must refer to the generally impartial historical outlines which are prefixed to the separate memoirs. Even a busy reader can see what has been done before, and what the upshot of each paper is.

ZOÖLOGY.

Are Potato Beetles Poisonous? — Although I have made no investigations regarding the poisonous nature of the Colorado potato bug, and am prejudiced neither *pro* nor *con*, the experiments of Messrs. Grote and Keyser as stated in the April Naturalist do not seem conclusive to me. I should not consider the innoxious nature of the *Doryphora* proven. Since heat changes many organic substances, it is not impossible that the "liquid" of their experiments may differ entirely from the juices of the living beetle. Their hypodermic injections would seem to prove the idea (if I understand their account correctly) that the beetles do possess some toxical properties. The heart of a frog separated from the body often beats for a longer period than that recorded in their article. Another possible source of error lies in the animal employed in their investigations. All animals are not equally susceptible to the action of poisons. Man is more so than the lower vertebrates, and they even differ among themselves in this respect. Thus it may be that the beetles have qualities injurious to man, while they have no effect on frogs and toads.

In the above remarks I have not endeavored to prove the poisonous qualities of the beetles, but to express my reasons for denying the cogency of the reasoning employed in the article referred to, and to turn the attention of other investigators to the subject. — J. S. Kingsley.

The Labrador Duck. — H. E. Dresser, Esq., the well-known ornithologist, author of the Birds of Europe, is desirous of obtaining information respecting this bird (*Camptolæmus Labradorius*), such as its geographical distribution (past and present), anything tending to elucidate its habits, and, in particular, a list of the specimens known to be preserved in United States collections. In this last matter, will the custodians of collections in which the bird is represented kindly interest themselves? Mr. Dresser furthermore authorizes me to offer £40 ($200, gold), for a pair, male and female, in good order. Communications may be addressed to him, No. 6 Tenterden Street, Hanover Square, London, W., or to the undersigned. — Elliott Coues, Smithsonian Institution, Washington, D. C.

The Cotton Worm. — Mr. Grote, in the last Alabama Geological Report, states his belief that the cotton worm is an imported insect and not indigenous to the Southern States. In Alabama it does not appear on the plants before June or July.

ANTHROPOLOGY.

ANTHROPOLOGICAL NOTES. — Under the editorial supervision of Mr. Edward Arber, of London, a volume of great interest will appear during the coming season. It will be a reprint of the first three English books on America. The first was printed at Antwerp by John of Doesborowe, about 1511, a book "of the new Landes, and of the People founde by the Messengers of the Kynge of Portyngale, named Emanuel." The second is a translated extract from the Cosmographia (1540) of Sebastian Muenster, professor of Hebrew at the University of Basle, entitled A Treatese of the Newe India, with other new founde Landes and Islandes as well Eastwarde as Westwarde, as they are known and founde in these our days, etc. The third is a collection of the first English Voyages, Traffics, and Discoveries, containing Peter Martyr's Decades, and other interesting articles.

The attention of anthropologists is most earnestly directed to the circular letter of the anthropological subsection of the American Association for the Advancement of Science, inviting them to attend the meeting to be held in Buffalo the present year, prepared to read papers on interesting subjects.

Messrs. Macmillan have in press a volume by Mr. E. G. Squier, being "Incidents of Travel and Explorations in the Land of the Incas."

Correspondenz-Blatt of January 1st has a supplement containing a catalogue of all the public and private collections of ethnological, anthropological, and prehistorical collections in Germany. The Smithsonian Institution commenced such a catalogue for all branches of scientific study within the United States, some time ago, and many hundreds have responded to their circular.

The fourth number of *Revue d'Anthropologie* comes to us with an unusually interesting collection of articles. The principal ones are Recherches sur l'Indice Orbetaire, by Paul Broca; Ethnogénie des Populations du Nord-Ouest de la France, by Gustave Lagneau; Origine du Bronze, by G. de Mortillet; Le Feu chez les Peuplades primitives, by Mme. Clemence Royer.

The contents of the twelfth number of Matériaux pour l'Histoire primitive et naturelle de l'Homme are of a more special character. The drawing of the royal tomb of Koaloba, in the Crimea, possesses much interest.

A very interesting paper was read before the British Scandinavian Society, January 18th, on some recent discoveries of tumuli belonging to the viking age. Among other objects a boat eighty feet long and eighteen wide, with high prow, is like some now used in certain parts of the Norwegian coast.

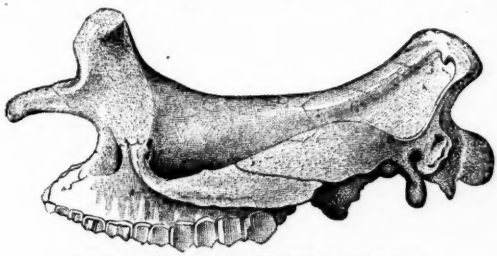
Lieutenant-Colonel Playfair reports the discovery at Aurès, in Algiers, of Roman ruins of the most magnificent character. The inhabitants bear unmistakable testimony to the classic origin of their features, language,

and customs. Many remains of Roman edifices, some of them crowned with Byzantine structures, were found. The full account is in a Blue Book, just issued, of consular reports to the Foreign Office, London.

Dr. Hooker is in receipt of a private letter describing the warlike habits of the Papuans. No man leaves his dwelling for his bit of cultivated land, even, without his powerful bamboo bow and a few deadly poisoned arrows. These are pointed and barbed with human bone, brought to almost needle-like sharpness, and most carefully and neatly finished. They are poisoned by being plunged in a human corpse for several days. — O. T. Mason.

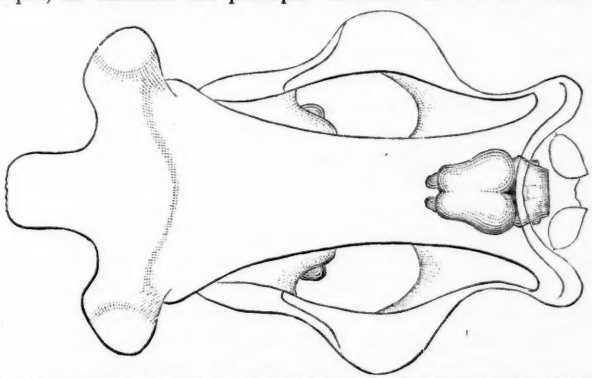
GEOLOGY AND PALÆONTOLOGY.

Gigantic Mammals of the Rocky Mountains. — We have already (page 182) called attention to Professor Marsh's discovery of the remarkably small brain of the *Dinocerata*, a group of large tertiary



(Fig. 19.) SKULL OF BRONTOTHERIUM INGENS.
Side view; one twelfth natural size.

mammals of the West. In the *American Journal of Science and Arts* for April, he discusses the principal characters of the *Brontotheridæ*,



(Fig. 20.) OUTLINE OF SKULL AND BRAIN CAVITY OF BRONTOTHERIUM INGENS.
Top view; one tenth natural size.

which were mammals nearly equaling the elephant in size, but with shorter limbs, and with a flexible nose as in the tapir, but no true proboscis. They lived in the lake basins of Dakota, Nebraska, Wyoming, and Colorado in the early Miocene Tertiary period. Figure 19 represents a side view of the skull of *Brontotherium ingens* Marsh, one twelfth of the natural size, and Figure 20 is an outline of the skull and brain cavity of the same animal, one tenth of its natural size, showing the remarkably small size of the brain. On the plates are views of different parts of the skeleton and of casts of the brain cavity.

GEOGRAPHY AND EXPLORATION.

Is it Possible to Unite the Black Sea and the Caspian?— Major Wood answers this question in the affirmative in the *Geographical Magazine* for February. He says that though the present level of the Caspian Sea is about eighty-four feet below the ocean level, it must be remembered that the highest point in the Manytch Channel, connecting the Euxine and Caspian basins, is but twenty-four feet above ocean level. "Manifestly, therefore, if these twenty-four feet were cut through, the waters of the Sea of Azof would pass into the Caspian basin and fill it up. Nor would such an enterprise present the shadow of a difficulty to the engineering genius which has already brought into being the great excavators that were used on the Suez Canal.

"The result of the filling up of the Caspian basin would be the destruction of Astrakhan and of all other buildings situated below ocean level on the Caspian littoral, and the project therefore would not appear at first sight to be a desirable one." Its execution would increase the water-spread of the Caspian from an area of 140,000 square miles to one of 250,000 square miles, and provide an ocean route to the eastern shore of the Caspian, and thus aid in developing the civilization of Central Asia.

Ancient Geographers. — It is not too much to assert, says a writer in the *Geographical Magazine*, that all the geographical achievements of the age, stupendous as they are, have been virtually nothing more than a grand and successful filling-in of the vague outlines bequeathed to us by the past. The Suez Canal was the idea of Pharaoh-Necho; the establishing of a beaten track across the Isthmus of Panama, that of Cortez and Nuñez de Balboa; the Mont Cenis passage, that of Hannibal; the commercial highway across Central Asia, that of Alexander the Great; the diverting of the Oxus into another channel (which, however, is scarcely possible now), that of Octai Khan; the voyage eastward round the cape, that of Xerxes; the search for the source of the Nile, that of half a dozen Egyptian kings, as well as of their conqueror, Cambyses, centuries before the Christian era; the existence of great inland seas in South Africa, that of the Portuguese explorers of the sixteenth

century, some of whom, if we are not mistaken, have got more than one of these new "discoveries" of ours marked on their maps! In short, we may say with the Irish school-master, when he found one of his own similes in Homer, "Curse thim ancients, they 've stolen all our best ideas!"

Inundation of the Sahara. — The idea of converting the Western Sahara into an inland sea is discountenanced by Mr. E. G. Ravenstein, who thinks that the plan is premature. He claims that the natural outlets of the Sahara are Tripoli, Algiers, Morocco on the north, the Atlantic seaboard on the west, and the Senegal and Niger on the south. "It is by these roads the necessities of the inhabitants of the Sahara are supplied, and their surplus produce is exported, and they will suffice for a long time to come."

Map of Prehistoric Ruins in Colorado. — A Preliminary Map of Southwestern Colorado and Parts of the Adjacent Territories, showing the Location of Ancient Ruins, issued by the United States Geological and Geographical Survey of the Territories, F. V. Hayden in charge, will be found of much use by archæologists and travelers, as it gives the localities of the ancient rock ruins and cliff-houses discovered by the survey.

MICROSCOPY.[1]

San Francisco Microscopical Society. — This working society now numbers about forty active members, and its annual receptions and semi-monthly meetings are well sustained. During the past year it has commenced the formation, by purchase and donation of books and subscriptions to magazines, of a suitable library, and has added to its supply of apparatus a Nachet microscope whose one-eighth objective, which has no collar adjustment, with Nachet's oblique condenser, resolved promptly and easily into beads No. 19 of Möller's test-plate. Among the notable additions to the cabinet of slides are a series of slides of the wall rocks of the gold-bearing veins of California; a series of sections of the woods of California; a slide of the curious diatom, *Schizonema Grevillii*, remarkable for its great external resemblance to some forms of algæ, the frustules of which were contained in a regular tubular frond, in which they were living when found, and up and down the canal of which they were seen to move; a slide of crystals of salt obtained by slow evaporation from the tear of a child; and a fragment of photographic paper mounted in balsam to exhibit the minute specks which are so annoying to the photographer, and which appeared as white spots containing a dark nucleus of an arborescent crystalline formation, black oxide of manganese being believed to be the cause of the spots, and hydrochloric acid being suggested as a possible means of removing them. The work of the society seems to be mainly directed to the legitimate natural history applications of the microscope, though not without some

[1] This department is conducted by Dr. R. H. Ward, Troy, N. Y.

such diversions as public exhibitions and a moderate amount of "microscopic gymnastics" in the way of "test-object" resolution. Mr. Kinne's paper on the method by which a fly walks in an inverted position was brought so strongly before the attention of the publishers of a school-book in which the familiar facts of the case were misrepresented, that they promised to suppress the erroneous article in future editions. The excellent annual address of the president, Prof. Wm. Ashburner, recommends that, in addition to the advantages furnished to members, the privileges of the rooms be extended to investigators who might not be able to incur the expense of regular membership.

KINNE'S TURN-TABLE. — This is a self-centring table in which the object is held diagonally between rectangular clutches, as in the "Cox table." This was contrived independently, though published subsequently to Mr. Cox's invention, from which it differs in moving the clutches by a lever and spiral instead of a screw.

COMPARATIVE PHOTOGRAPHS OF BLOOD. — Dr. J. G. Richardson, for the sake of illustrating in criminal cases the distinguishable appearances of different kinds of blood, has flowed drops of blood from different animals so nearly in contact on the glass slide that portions of the two drops appear in the same field and can be photographed together. Dr. C. Leo Mees has modified this method and obtained exquisite results in specimens presented to the microscopical section of the Tyndall Association. He spreads the blood by Dr. Christopher Johnson's method, which is to touch a drop of blood to the accurately ground edge of a slide, and then draw it gently across the face of another slide, leaving a beautifully spread film. In this way one kind of blood is spread upon the slide and another on the cover. When dry, one half of each is carefully scraped off with a smoothly sharpened knife, and the cover inverted upon the slide in such position as to bring the remaining portions of the film into apposition. Under the microscope and in the photograph the two kinds of blood appear in remarkably fine contrast, even those bloods that are too nearly alike for safe discrimination in criminal cases being easily distinguished when thus prepared from fresh material.

"RUSTY GOLD." — Mr. Melville Attwood, in his paper on this subject before the San Francisco Microscopical Society, discredits the belief of the miners that a thin film of oxide of iron forms on gold and prevents a successful separation of the gold by means of amalgamation. He believes the failure of the miners to obtain good results to be due far more to an unexpected poverty of the quartz than to any difficulty in causing the quicksilver to combine with the gold that is really present.

EXCHANGES. — (Notices, not exceeding four lines in length, of microscopical objects or apparatus wanted or offered in exchange, not sale, will be inserted in this column without expense.)

Diatoms, prepared or unprepared, in exchange for others. Correspondence desired with amateurs interested in mounting arranged dia-

toms. — Galloway C. Morris, Tulpehocken Street, Germantown, Philadelphia, Penn.

Magic-lantern transparencies or cabinet-size photographs of microscopic objects in exchange for suitable slides. — R. H. Bliven, Elmore, Ohio.

Polarizing Crystallizations. — Mr. C. C. Merriman, of Rochester, gives the following useful hints in regard to the preparation of the exquisite polarizing objects contributed by him to the Postal Micro-Cabinet Club: "All solutions must be in distilled water, and carefully filtered. Solution of gum arabic must be added to the crystalline solution until the drops will dry on the slide without crystallizing. Then the drop on the slide is to be held over steam until one or more points of crystallization appear; then at once dried over an alcohol lamp; then held over the steam again until the crystals have grown a trifle larger, and so on until the specimen is satisfactory. The specimens are to be first varnished over with a film of collodion, such as photographers use, and then mounted in old Canada balsam." Specimens thus prepared have been perfectly preserved for many years, though some of them are spoiled by re-crystallization after mounting.

American Microscopical Societies. — The following list of microscopical organizations is corrected to date, with the exception of a few instances, where further information could not be obtained. Secretaries and others interested are specially requested to furnish such corrections and additions as may become necessary from time to time.

Agassiz Institute, Sacramento, Cal. Organized 1872. Meets second Tuesday evening of month. President, —— ——; Vice-President, Rev. I. E. Dwinell, D. D.; Secretary, A. P. Andrews; Cor. Secretary, Rev. J. H. C. Bronte.

Academy of Natural Sciences, Philadelphia; Biological and Microscopical Section. Organized 1868. Meets first Monday evening of the month, except July and August, in the hall of the Academy, cor. 19th and Race sts. Director, W. S. W. Ruschenberger, M. D.; Vice-Director, James Tyson, M. D.; Recorder, J. G. Richardson, M. D., 1835 Chestnut St.; Cor. Secretary, J. H. McQuillen, M. D.; Treasurer, Isaac Morris, M. D.; Conservator, J. Gibbons Hunt, M. D.

American Association for the Advancement of Science; Microscopical Sub-Section. Has met occasionally in connection with the migratory sessions of the association. It is intended to organize permanently at the Buffalo meeting next August.

American Microscopical Society of the City of New York. Organized 1865. Meets second and fourth Tuesday evenings of the month, at 35 East 10th St. President, John B. Rich, M. D.; Vice-President, William H. Atkinson, M. D.; Secretary, C. F. Cox, 13 William St.; Treasurer, T. d'Orémieulx; Curator, O. G. Mason.

American Postal Micro-Cabinet Club. Organized 1875. Business

conducted exclusively by mail. President, Prof. John Peirce, Providence, R. I.; Secretary, Rev. A. B. Hervey, 10 North Second St., Troy, N. Y.; Managers, R. H. Ward, M. D., Troy, N. Y., and C. M. Vorce, Cleveland, Ohio.

Bailey Club, New York city. A small club of working microscopists. Meetings informal, every second Tuesday, at residences of members.

Boston Microscopical Society. Organized 1873. Meets first and third Thursdays of month, at residences of members. President, David Hunt, Jr., M. D.; Vice-Presidents, Stephen P. Sharples, S. B., and Alfred F. Holt, M. D.; Secretary and Treasurer, R. R. Andrews, D. D. S., Brattle Square, Cambridge, Mass.; Council, S. W. Creech, Jr., J. Frank Brown, and Edward Moulton; Custodian, C. H. Osgood, D. D. S.

Boston Society of Natural History; Microscopical Section. Organized 1864. Meets second Wednesday evening of month. Committee, Edwin Bicknell, R. C. Greenleaf, and B. Joy Jeffries, M. D.

Buffalo Microscopical Club, Buffalo, N. Y. Organized 1876. President, Prof. George Hadley, M. D.; Secretary, James W. Ward; Advisory Council, H. R. Hopkins, M. D., Henry Mills, and Prof. D. R. Kellicott.

Dartmouth Microscopical Club, Hanover, N. H. Organized 1870. President, Prof. E. Phelps; Vice-President, Prof. L. B. Hall; Cor. Secretary, Hiram A. Cutting, M. D., Lunenburgh, Vt.

Denver Microscopical Society.

Dunkirk Microscopical Society, Dunkirk, N. Y. Organized 1874. Meets second Friday evening of month. President, George E. Blackham, M. D.; Secretary and Treasurer, M. E. C. Shelton.

Fairmount Microscopical Society, Philadelphia. Organized 1871. Meets third Thursday evening of month. President, S. H. Griffith, M. D.; Secretary and Treasurer, William C. Stevenson, Jr., 24 South 4th St.; Managers, Jno. Gordon Gray, E. O. Shakespeare, M. D., and B. F. Quimby.

Indiana Microscopical Society, Indianapolis, Ind. Organized 1874. Meets first Friday evening of month, at residences of members. President, William B. Fletcher, M. D.; Secretary and Treasurer, E. Hadley, M. D., 191 Va. Ave.

Jamestown Microscopical Society.

Kirtland Society of Natural History, Cleveland, Ohio; Microscopical Branch. Secretary, John Bowers.

Louisville Microscopical Society, Louisville, Ky. Organized 1874. Meets first and third Thursday evenings of month. President, Prof. J. Lawrence Smith; Vice-Presidents, Noble Butler and C. F. Carpenter, M. D.; Treasurer, C. J. F. Allen; Secretary, John Williamson; Cor. Secretary, E. S. Crosier, M. D.

Maryland Academy of Sciences, Baltimore, Md.; Section of Biology and Microscopy. Organized 1874. Meets first and third Wednesday

evenings of month, at Academy Buildings, Mulberry St. Chairman, B. W. Barton, M. D.; Secretary, W. G. Harrison, M. D., 69 Centre St.

Memphis Microscopical Society, Memphis, Tenn. Organized 1874. Meets first and third Thursday evenings of month, at 218 Main St. President, S. P. Cutler, M. D.; Secretary and Treasurer, A. F. Dod, 257 Main St.

New Jersey Microscopical Society, New Brunswick, N. J. Organized 1871. Meets second Monday evening of month at Rutgers College. President, Prof. F. C. Van Dyck; Rec. Secretary, Rev. Samuel Lockwood, Ph. D., Freehold, Monmouth Co., N. J.

Providence Franklin Society, Providence, R. I.; Microscopical Department. Organized 1874. Meets every second Wednesday evening at rooms in North Main St. President, Prof. Eli. W. Blake, Jr.; Vice-President, A. O. Tilden; Secretary, Prof. John Peirce; Treasurer, C. B. Johnson, M. D.; Librarian, N. N. Mason.

San Francisco Microscopical Society, San Francisco, Cal. Organized 1872. Meets first and third Thursdays of month at 531 Cal. St.; President, Prof. William Ashburner; Vice-President, Henry C. Hyde; Rec. Secretary, C. Mason Kinne, 422 Cal. St.; Cor. Secretary, Charles W. Banks; Treasurer, Charles G. Ewing.

Society of Natural Sciences, Buffalo, N. Y.; Microscopical Section. Organized 1872. Curator, Henry Mills, 162 Fargo Ave.

State Microscopical Society of Illinois, Chicago, Ill. Organized 1869. Meets second and fourth Fridays of month, at the Academy of Sciences. President, Henry W. Fuller; Secretary, B. W. Thomas; Cor. Secretary, Charles Adams; Treasurer, Geo. M. Higginson.

State Microscopical Society of Michigan, Kalamazoo, Mich. President, Rev. Dr. Foster.

Troy Scientific Association, Troy, N. Y.; Microscopical Section. Organized 1870. Meets first Monday evening of month, except July and August, at residences of members. President, R. H. Ward, M. D.; Vice-President, Rev. A. B. Hervey; Secretary, Prof. Arthur W. Bower.

Tyndall Association, Columbus, Ohio; Microscopical Section. Organized 1874. Meets first and third Saturday evenings of month. President, Rev. I. F. Stidham; Secretary, C. Howard; Curator, M. Hensel.

The Leeuwenhoek Medal. — The first award under the provision made at the two hundredth anniversary of the discovery of infusoria by Leeuwenhoek, for bestowing a medal in his honor upon distinguished microscopists, has been received by the oldest European candidate, Professor Ehrenberg, of Berlin.

New Adjustment for Cox's Turn-Table. — A slide may be, by this turn-table, centred for width only, by laying it on the table at right angles to the line of the spindle and placing triangles of brass, or even cardboard, between it and the clutches which are designed to hold the corners of the slide. When thus arranged the slide may be slipped so

as to bring different parts of its median line successively to the centre of the apparatus, and thus a series of cells may be made upon the same slide, or any desired group of cells may be made by using a variety of unequal triangles. For common use the two triangles should be exactly alike, should be right-angled, and should have the sides adjoining the right angle one inch in length. Such pieces may be cut from sheet brass about the thickness of an ordinary glass object slide. These triangles may also be used, with the addition of a few cardboard blocks, for the purpose of decentring, in refinishing old slides that have not been accurately centred.

SCIENTIFIC NEWS.

— In the Seventh Annual Report of the American Museum of Natural History it is stated that the trustees have purchased Professor Hall's palæontological collection for $65,000, and Mr. Squier's rare collection of antiquities from South and Central America; $200,000 have been appropriated by the New York legislature for furnishing the magnificent new museum building on Manhattan Square. The number of visitors to the museum, still remaining in the old arsenal, averages 13,577 a week, the weekly average of visitors to the entire British Museum, embracing all the exhibition halls, being 11,574 in 1874.

— The Bulletin of the United States Geological and Geographical Survey of the Territories, vol. ii. No. 1, contains A Notice of the Ancient Remains of Southwestern Colorado, examined during the Summer of 1875, by W. H. Holmes; A Notice of the Ancient Ruins in Arizona and Utah lying about the Rio San Juan, by W. H. Jackson; The Human Remains found near the Ancient Ruins of Southwestern Colorado and New Mexico, by Dr. Emil Bessels.

— Mr. Grote's Check-List of the Owlet Moths or Noctuidæ of America, Part I., Bombyciæ and Noctuelitæ (Buffalo, N. Y., pp. 28), is a very useful catalogue. It is accompanied by a photograph illustrating several new species.

— From *The Round Table and Beloit Monthly* we learn that a bill has been passed by the legislature of Wisconsin appropriating $25,000 for printing the geological reports made during the past three years by he late Dr. Lapham and others, as well as those that shall be prepared by Professor Chamberlain, who has been appointed to complete the work. The New York *Nation* states that $10,000 has been appropriated by the same legislature for the purchase for the university of Dr. Lapham's collections and library. It also is to print for the Wisconsin Academy of Sciences a volume of transactions in alternate years.

— Professor Angelin, a Swedish geologist and palæontologist, died at Stockholm on the 13th of February, aged seventy.

— Prof. F. V. Hayden has been elected a member of the Imperial Society of Naturalists of Moscow.

— A course of summer instruction will be given at Bowdoin College, Brunswick, Maine, in chemistry and mineralogy by Professor Carmichael and Mr. Robinson, while botany will be taught by Mr. F. L. Scribner. The Normal School of Natural History will hold a second session at Normal, Illinois. Professors Gastman and Forbes are the directors.

— The government of India is making arrangements for an archæological survey of the whole country.

— Dr. A. B. Hoyt writes us from Grafton, N. H., that he saw a bullfrog nearly swallow a common striped snake about one foot long. At one time not more than five inches of the snake was out of the frog's mouth.

— Baron von Nolken, of Riga, Russia, has gone with an assistant to Bogota for the purpose of collecting and observing insects. The microlepidoptera that he collected there on his previous journey have been described by Professor Zeller, and the work will be published by the Entomological Society of Russia.

— Professor Alpheus Hyatt is now engaged in monographing distorted forms of fresh-water shells from the famous Tertiary locality of Steinheim, and desires to make comparisons with living or fossil shells from other localities. He has already obtained shells in which the normal spiral was more or less distorted or unwound, from two other localities, but wishes to obtain more extensive information, and offers in exchange suits of Steinheim shells, *Valvata* or *Planorbis multiformis*, with from four to sixteen distinct varieties. Distorted forms have been heretofore mostly found in perfectly still, inclosed basins of limited extent with no outlet. Information with regard to similar localities is also requested. Address Society of Natural History, corner of Berkeley and Boylston streets, Boston, Mass.

— Dr. Steindachner, the well-known ichthyologist, who spent some time in this country studying the fishes of North and South America, has just been appointed director of the Imperial Zoölogical Museum at Vienna, in place of Dr. Redtenbacher, lately deceased.

— Mr. M. Tompkins, of Silver Islet, Ontario, Canada, writes us that he has a female white pelican (*Pelecanus erythrorhynchus*) with a horny crest on the mandible as in that described by Professor Snow in the NATURALIST (ix. 665). It was shot by an Indian on the north shore of Lake Superior, near the old Hudson Bay Company's Post, Fort William, Thunder Bay.

— At the last meeting of the American Academy of Arts and Sciences, Prof. William Everett read a paragraph from Æschylus' Prometheus referring, as he thought, to the river Zambesi, and showing that the Greeks of a period before that of Herodotus had a more intimate knowledge of the interior of Africa than they have had the credit for.

— Haeckel has studied the development of the annelid worm, *Fabricia*,

one of the family *Sabellidæ*, and finds that it passes through a true "gastrula" condition. This is the first time that this stage of development has been traced in the higher worms. In studying these embryos he used carmine and hæmatoxylin as staining agents, the embryo being rendered transparent by glycerine.

— Prof. E. Ray Lankester, in his abstract of Haeckel's article on the Gastræa theory, actually includes the Ascidians in the Vertebrates, adding in a foot-note that "Professor Haeckel is not responsible for the classification here adopted of the Tunicata under the great group of Vertebrata."

— To elicit facts as to the migration of birds, *Forest and Stream* proposes to each one of its readers the plan of noting down, in reference to the birds of his district, observations upon some or all of the following points: —

(1.) Whether each species is resident throughout the year, is a summer or winter visitor, or only passes through in spring and fall.

(2.) With reference to each species in his locality, whether it is "abundant," "somewhat common," or "rare."

(3.) What species breed, and whether more than once in a season.

(4.) Dates of arrival, greatest abundance, nest-building, laying eggs, hatching of young, and beginning of departure of each species, and when it is last seen in the fall.

(5.) What effect, if any, upon the relative abundance of particular birds, in retarding their arrival or hastening their departure, sudden changes of the weather, storms, and "late" and "early" seasons appear to have.

(6.) Similar notes upon the appearance and movements of the quadrupeds, reptiles, and fishes of the region; and upon the times of flowering of trees and plants.

(7.) Other occurrences considered noteworthy.

Among the birds most likely to be reported upon, and which are the best exponents of the laws of migration, are the following, and to them especial attention is asked: cat-bird, blue-bird, summer yellow-bird or yellow warbler, golden-crowned thrush, redstart, barn swallow, goldfinch or thistle-bird, song sparrow, chewink or towhee-finch, bobolink, red-winged blackbird, meadow lark, Baltimore oriole or hang-nest, phœbe-bird or bridge pewee, chimney swift or swallow, kingfisher, red-headed woodpecker, woodcock, killdeer plover, Wilson's snipe, white crane, wood duck, wild geese.

If every naturalist or beginner in science would commence this spring to record such facts as these, it would induce him to observe much more closely and systematically than he might otherwise.

— It may interest our botanical readers to learn that Mr. A. W. Bennett, of London, has been for some time engaged on a translation of Thomé's Lehrbuch der Botanik. It will be published in the course of the present year by Messrs. Longmans, with all the original illustrations.

PROCEEDINGS OF SOCIETIES.

NATURAL HISTORY SOCIETY, Montreal. — February 28th. A paper on the Nipigon or copper-bearing rocks of Lake Superior, with notes on copper mining in that region, was read by Mr. J. W. Spencer.

Principal Dawson called the attention of the members present to an interesting collection of ferns and other fossil plants which had been recently obtained by Mr. Albert J. Hill from near Sydney, Cape Breton, some of which were exhibited. He said that they were of interest as showing the occurrence of forms hitherto known only in the middle and upper coal formations, in beds assigned, on stratigraphical evidence, to the upper part of the Millstone-Grit. They were also of interest from the presence of at least four species of ferns showing fructification, which would shortly be described. They were further of interest as occurring in the same beds with the remains of a fossil larva of a dragon-fly, which will be described by Mr. Scudder in the next number of the *Canadian Naturalist*, and which is the first insect of that family found in the Carboniferous rocks.

ACADEMY OF SCIENCES, St. Louis. — March 6th. Professor Conant, who had lately visited Southwest Missouri and examined certain curious mounds there, situated some miles from New Madrid, gave a brief account of his trip. One curious discovery made was that while the skulls taken from the centre of these mounds were the true mound-builder skulls, two were found in the edge of one of the mounds that belonged to a very different race. The exceedingly low, retreating forehead indicated a much lower grade of organism, yet the remains had been buried after the mound-builder fashion, with a jug on each side of the head.

March 20th. Professor Potter reported that Dr. G. I. Engelmann and himself had visited the New Madrid mound region, and opened four mounds, securing ten or twelve skulls and about one hundred specimens of pottery.

G. C. Broadhead read a paper on the Porphyritic Rocks of Southeastern Missouri, presenting evidence that these rocks are Huronian.

A. J. Conant read a paper on the Mounds of New Madrid. The burial-mound examined by him was found within an inclosure of about fifty acres, which is surrounded by earthen walls. Probably a thousand skeletons have been already found. Three pieces of pottery are usually found with each skeleton. Some vessels were more than a foot in diameter, with walls so thin that they could not have been safely moved when filled with water. It was observed that some skeletons were in a much better state of preservation than others. In some cases the outline of the skull was shown only by a thin white line; in others the usual pieces of pottery were found, but all traces of the skeleton had disappeared. Mr. Conant thought this an evidence that the mounds had long been a place of burial.

Dr. Engelmann remarked that the preservation of bones depends upon humidity and the character of the soil. Many bones undoubtedly older than the bones of these mound-builders are found in a state of good preservation.

Dr. Engelmann made a communication on North American Oaks. The genus *Quercus* is more extensively developed in America than in any other part of the world. In the Carolinas, oaks grow as small shrubs. The leaves of different oaks show great variation, some resembling the leaves of the willow, others those of the holly, etc., but the fruit is very much the same in all. The typical and probably the primitive oak of the tertiary had an acorn and a lobed leaf. An oak found in California has flower and leaves like a chestnut, but bears acorns like an oak. The cup of the acorn, however, is spiny like the burr of the chestnut. Dr. Engelmann remarked that this oak may be a hybrid produced between the chestnut and the oak in bygone times when these genera were less differentiated, as it is well known that even now hybrid oaks will propagate when removed from the "struggle for existence" against more hardy rivals.

Academy of Sciences, New York. — March 13th. The following papers were read: Further Researches on Phosphide of Silver, by Wm. Falke; A new Test for Boracic Acid, and other Qualitative Reactions, by M. W. Iles; Comparison of the Milk of the African Race with that of the Caucasian, by Henry A. Mott, Jr.; Milk and the Lactometer, by Elwyn Waller.

Geological Section. March 20th. Mr. S. W. Ford presented an account of the discovery of additional species of fossils in the primordial rocks of Lansingburgh, N. Y., and of plant-remains in the primordial slates at Troy, and described a new species of *Microdiscus* from the latter locality, for which he has proposed the name, *M. Meeki*. He also exhibited specimens of the hitherto imperfectly known pygidium of *Conocephalites* (*Atops*) *trilineatus*, from Lansingburgh. In conclusion he made some remarks upon the probable stratigraphical horizon of the Troy beds among primordial rocks, stating that the fauna of these beds, while entirely distinct in its species from that of the Acadian or Menevian group on the one hand, and from that of the ordinary Potsdam on the other, yet shows a decided leaning, in its genera, toward the former of these groups.

The president, Prof. J. S. Newberry, gave a *résumé* of his observations on the geology of the oil regions of the United States, — all of which he had visited, — and the results of his study of the facts which seem to illustrate the genesis of petroleum.

Very briefly stated, his theory of the origin of petroleum is that it is one of the evolved products of a spontaneous decomposition of organic tissue, chiefly vegetable, which begins as soon as life ceases, and ends only with the oxidation of all the contained carbon and hydrogen. When

exposed in moist air vegetable tissue rapidly oxidizes in *decay;* when buried under water or in earth the process is retarded, and the constituents react on each other, forming carbonic acid, carbonic oxide, water, carburetted hydrogen, petroleum, etc., which escape, leaving peat, lignite, coal, anthracite, and graphite as residues in different stages of this progressive change. Petroleum and marsh gas are constantly escaping from all considerable carbonaceous strata, and especially from bituminous shale, beds of which underlie all our productive oil regions, and are the sources of the oil and of the gas with which it is always associated.

The carbonaceous shales of the Lower Silurian system supply the petroleum of Burkesville, Kentucky, and Collingwood and probably Enniskillen, Canada. The petroleum of Western Pennsylvania is derived from the Devonian black shales ("Cadent" of Pennsylvania, "Huron" of Ohio), which have a thickness of several hundred feet, and underlie all the oil region. When escaping from them the oil and gas rise into a series of overlying sandstones and conglomerates, which serve as reservoirs, and are confined there by sheets of nearly impervious clay shale

The oil wells of West Virginia are bored in the coal measures, but in a much disturbed region, and the oil probably comes from the Huron shale. The oil of Mecca and Grafton, Ohio, is Lower Carboniferous. It is found in the Berea grit, but originates in a black shale (Cleveland shale) which underlies it.

Philosophical Society of Washington. — March 11th. Dr. Woodward continued his observations on *Frustularia Saxonica*, showing, by means of illustrations thrown upon a screen, the misapprehensions into which some continental microscopists had been led by mistaking for this species another diatom, *Navicula rhomboides.*

March 25th. Mr. Gilbert gave an account of lake formations, showing the various means by which lakes are produced, and, among others, one which had frequently been in his opinion mistaken for glacial action.

In cliffs of which the upper portion is subject to easy vertical cleavage, large masses are frequently detached, falling into adjacent valleys, damming up streams and forming lakes in this way with a mass of detritus which had been, or was liable to be, mistaken for the material deposited by a terminal moraine. These views were corroborated by Major Powell, who mentioned several instances of such lake formations.

Professor Mason then addressed the society on an international system of archæological symbols.

Academy of Natural Sciences, Philadelphia. — March 14th. Mr. Meehan spoke of the mode of propagation of the Florida moss or Tillandsia. Since he had before spoken on the subject he had had opportunities of observing that where the seeds germinate they do so on the under side of the branches, and where the bark is smooth rather than rough, thus indicating the presence of some adhesive matter on the seed.

Professor Cope called attention to a cetacean which he had observed

and described ten years ago. He had recently had an opportunity of examining an entire skeleton. It belongs to the black fish, but differs specifically from its nearest ally, and seems to be almost intermediate between the genera *Globiocephalus* and *Grampus*. The anatomical characters separating these were given, and the name *Globiocephalus brachypterus* was proposed for the species.

Professor Frazer spoke of a peculiar trap from York County. Dr. Koenig, having been engaged upon the investigation of the minerals occurring at Magnet Cove, Arkansas, gave a preliminary notice of some of his results.

Mr. B. Waterhouse Hawkins, having stated that he was at present employed in rebuilding the skeleton of Hadrosaurus in the museum, reviewed the subject of the position of the so-called clavicles, referring specially to the opinions of Professors Leidy, Huxley, and Cope. He reminded the members that in 1868, when studying the remains contained in the museum, he had adopted the opinion first advanced by Dr. Leidy, and assigned the bones in question to the pelvic arch. Professor Cope, in 1867, had published his opinion that they were pubes, but had afterwards assigned them to the position of ischia, thus indorsing the view advanced by Professor Huxley. Mr. Hawkins had already on at least one occasion demonstrated before the Academy that this opinion of Cope and Huxley was not supported by the necessities of the creature's organization, and had advanced the opinion in 1875, and previously, that the bones in question were really pubes, having the long section so placed as to support the abdominal walls, as in the crocodile and marsupials. Attention was called to the fact that corresponding bones had recently been placed by Owen in his description of Omosaurus as pubes, thus establishing the correctness of the position taken by Mr. Hawkins, with regard to them in Hadrosaurus, as far back as 1868, and steadily adhered to by him in spite of the authority of the eminent naturalists who up to the present time held a contrary opinion. Professor Cope complimented Mr. Hawkins on the results established by Owen's description of Omosaurus, and further referred to the position of the bones under consideration.

A paper was presented for publication entitled On Pachnolite and Thomsenolite, by George Augustus Koenig, M. D.

Troy Scientific Association. — March 6th. Microscopical section. The fructification of Algæ was discussed, and illustrated by slides contributed by the members. Dr. J. J. Woodward's photographs of the spurious lines of *Frustulia Saxonica* were presented by Dr. R. H. Ward.

March 20th. General meeting. Rev. A. B. Hervey delivered an address on the classification of sea-weeds.

Boston Society of Natural History. — March 1st. Mr. Alexander Agassiz remarked on the affinities of starfishes, and Dr. Hagen read a paper on The Danger from White Ants to New England.

APPALACHIAN MOUNTAIN CLUB, Boston. — March 8th. Papers were read on the following subjects: The Atlantic System of Mountains, by Prof. C. H. Hitchcock. Illustrated by a new Model of the White Mountains. A Day on Tripyramid, by Prof. Charles E. Fay. Two New Forms of Mountain Barometer, by Mr. A. B. Emmons. Exhibition of Mountain Profiles, by Mr. G. F. Morse.

SCIENTIFIC SERIALS.[1]

ANNALS AND MAGAZINE OF NATURAL HISTORY. — February. On Mr. Carter's Objections to Eozoön, by J. W. Dawson. Dr. R. Willemoes-Suhm on the Development of *Lepas fascicularis* and the "Archizoëa" of Cirripedia, and on the Development of some Pelagic Decapods. March. On the Polytremata (Foraminifera), especially with Reference to their Mythical Hybrid Nature, by H. J. Carter. On the Budding of the Cuninæ in the Stomach of the *Geryonidæ*, by B. Uljanin. Evidence of a Carnivorous Reptile about the Size of a Lion, by R. Owen. On the Relations of *Artemia salina* and *Artemia Mühlhausenii*, and on the genus *Branchipus* by M. W. J. Schmankewitsch.

ZEITSCHRIFT FÜR WISSENSCHAFTLICH ZOÖLOGIE. — December 22, 1875. On the Structure and Development of *Sycandra raphanus*, by F. E. Schultze. On the Sexual Organs of *Branchipus Grubii*, by H. Nitsche. On the Transformation of the Mexican Axolotl into an Amblystoma, by A. Weismann. On the Systematic Position of *Vortex Lemani*, by L. Graff. Contribution to the Knowledge of the Bryozoa, by H. Nitsche. January 17, 1876. The Developmental History of *Proteus anguineus*, by F. E. Schultze. Notes on the Developmental History of the Najadæ, by W. Flemming. On the Anatomy of Crinoids, by H. Ludwig.

PETERMANN'S GEOGRAPHISCHER MITTHEILUNGEN. — December 15, 1875. The Mongols and the Land of the Tanguts. Steamer-Communication between Brazil and Columbia, by R. Reyes. On the History of Discovery of the Western Coast of Australia. Stanley's Researches on the Victoria Nyanza (continuation).

PSYCHE. — February. Odoriferous Glands in Phasmidæ, by S. H. Scudder.

GLOBUS. — Nos. 6–9 contain Rebatel and Tirant's Journey in Tunis (with excellent illustrations).

THE GEOGRAPHICAL MAGAZINE. — March. Cameron's Route from Lake Tanganyika to the West Coast of Africa, by E. G. Ravenstein. The Irrigation of Firozpur, by C. R. Markham. The World's Future Coal Depot, by D. Ker. The Voyage of the Challenger, by J. G. Davis. April. The Russian Campaign in Khokand, by A. Vambery. Peru.

[1] The articles enumerated under this head will be for the most part selected.

by C. R. Markham. The Island of Palawan, by C. Pascoe. Easter Island Tablets.

The Geological Magazine. — March. Subaerial Denudation *versus* Glacial Erosion, by W. Gunn. On the Classification and Nomenclature of Rocks, by G. H. Kinahan. Sketch of the Geology of Ice and Bell Sounds, Spitzbergen, by A. E. Nordenskiöld. (Part iii.) April. A Comparison between the Oldest Fossiliferous Rocks of North Europe, by G. Linnarsson. The Probable Conditions under which the Palæozoic Rocks were deposited in the Northern Hemisphere, by H. Hicks.

Quarterly Journal of Microscopical Science. — April. Observations on the Early Development of the Common Trout, by E. Klein. Recent Researches on the Nuclei of Animal and Vegetable Cells, and especially of Ova, by J. Priestley. Contributions to the History of the Germinal Vesicle, and of the first Embryonic Nucleus, by E. van Beneden. A new Process for examining the Structure of the Brain, by H. R. O. Sankey. On the Development of the Ova and Structure of the Ovary in Man and other Mammalia, by J. Foulis. On the genus *Astrorhiza* of Sandahl, lately described as *Hæckelina* by Dr. Bessels, by W. B. Carpenter.

Monthly Microscopical Journal. — March. Mr. Sorby's Address as President of the Royal Microscopical Society. Further Notes on *Frustulia Saxonica*, by W. J. Hickie. On Staining and Mounting Wood Sections, by M. H. Stiles. On the Characters of Spherical and Chromatic Aberration arising from Excentrical Refraction, and their Relations to Chromatic Dispersion, by Dr. Royston-Pigott.

American Journal of Science and Arts. — April. Review of Croll's Climate and Time, with especial Reference to the Physical Theories of Climate maintained therein, by Simon Newcomb. Principal Characters of the *Brontotheridæ*, by O. C. Marsh.

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